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2016

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JRC101190

EUR 27861 EN

PDF	ISBN 978-92-79-57796-3	ISSN 1831-9424	doi:10.2791/528976	LF-NA-27861-EN-N
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How to cite: Kimmo Halme, Veli-Pekka Saarnivaara, Jessica Mitchell; RIO Country Report 2015: Finland; EUR 27861 EN; doi:10.2791/528976

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Abstract

The 2015 series of RIO Country Reports analyse and assess the policy and the national research and innovation system developments in relation to national policy priorities and the EU policy agenda with special focus on ERA and Innovation Union. The executive summaries of these reports put forward the main challenges of the research and innovation systems.

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Foreword

The report offers an analysis of the R&I system in Finland for 2015, including relevant policies and funding, with particular focus on topics critical for EU policies. The report identifies the main challenges of the Finnish research and innovation system and assesses the policy response. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites etc. The quantitative data is, whenever possible, comparable across all EU Member State reports. Unless specifically referenced all data used in this report are based on Eurostat statistics available in February 2016.

Acknowledgments

The report has benefited from comments and suggestions from Eeva Kaunismaa from the Ministry of Education and Culture.

Comments from DG RTD are gratefully acknowledged.

Peter Fako, Lorenzo Isella and Athina Karvounaraki produced the statistics and the analytical assessments for sections 3.2 and 3.6 of the report.

We would like to thank Sophie Bodart, Martine Troonen and Françoise Gandrey for their assistance in preparing this report for publication.

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Executive summary

This Research and Innovation Country Report for Finland provides an overview of the R&I system in 2015. It also examines developments connected with two EU policies – the European Research Area and the Innovation Union. This report was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports, websites, etc. The quantitative and qualitative data is comparable across all the other EU Member State reports whenever possible.

Economic growth in Finland has been slow for a prolonged period. In recent years, growth has been depressed not only by the weak international economy, but also by sectoral and structural problems. Finland's gross domestic product (GDP) declined continuously since the second half of 2012. The (GDP) at market prices was €205b in 2014 and GDP per capita €37,600, 37% above the EU-28 average (Eurostat, 2014). The performance of the Finnish economy is lagging well behind most countries in the euro area. Finnish export market shares decreased in most product categories between 2000 and 2013. The cumulated loss in market shares amounts to more than 32% between 2008 and 2013, which is the largest in the EU-28 (EC; Macroeconomic imbalances Country Report: Finland, 2015). Production costs in Finland have increased due to an approximately 10% rise in average wages relative to the euro area since 1999.

The impact of the economic recession and Nokia's fall have caused a remarkable decline in private and public R&D investments. Gross Expenditure on Research and Development (GERD as a % of GDP) has declined since 2009 when it was 3.75 %. The estimate for the year 2015 is 3.1%, significantly less than the 4% target set by the government. Governmental R&D funding increased during 2006–2010 by 15% but declined during 2010–2014 by 13% in real terms. It increased in 2015 by 0.6% and will fall again due to the new Government Programme¹.

Although the situation in Finland is challenging, productivity and living standards still rank high among the developed countries, the Finnish economy is knowledge-intensive, and has achieved a state of a continuous change towards a high and medium-high-tech specialisation. The country has several hot-spot clusters, which compare well internationally, in particular in the ICT, forestry, metal products and machinery, environment, materials, energy, wellbeing, and food and agriculture sectors. Finland also still ranks among the World's best in R&D intensity (Eurostat) and competitiveness (WEF; The Global Competitiveness Report 2015 – 2016), in terms of scientific and technological excellence and Innovation (Innovation Union Scoreboard or IUS 2015) and (GII - Global Innovation Index 2015; Cornell University, INSEAD, and the World Intellectual Property Organization WIPO). The IUS states that Finland is an Innovation leader (3rd), and its innovation performance steadily increased until 2012, when it declined slightly. Finland's performance relative to the EU has been declining from its peak of 30% above the EU average in 2007 to 22% in 2014. Therefore, Finland is slowly losing its position as one of the leading countries in innovation. The funding cuts by the new Government in education and research on the one hand target an increase in the quality of the Finnish research by unifying the dispersed research system, on the other hand, there are cuts in funding for building or strengthening the knowledge-base by industries, and boosting industrial research.

The role of private sector in the Finnish R&I system is strong. The share of GERD performed by the Business Enterprise Sector (BES) was 68%, and 66 % was funded by the BES in Finland in 2014. The high share of private funding is positive and a clear target. Segmenting private R&D expenditures based on the company size, 77% of the R&D was executed by large companies, 4% by micro companies and 19% by other SMEs in 2014. Thus, Finland's R&D is dominated by large companies.

¹ http://www.tilastokeskus.fi/til/tkke/2014/tkke_2014_2015-10-29_tie_001_en.html

The moderate role of the SMEs is a challenge for Finland. Foreign affiliates' share of funding has grown to 20% (2014) of the Business sector R&D expenditures which still is quite low, indicating modest internationalising of the economy. Public funding of private sector's expenses on R&D is very low, about 3%. These incentives are mainly focused on SMEs and start-ups, and their impacts have been proved to increase private investments in R&D but stronger incentives for the whole business sector would be needed for leveraging business expenditures in R&I as well as for increasing the relevance of public research for businesses. The Government has shifted the focus from direct grants to refundable forms of funding which will lower risk-taking and change the focus on near to market interests which may not support long-term building of knowledge capacity for innovation.

The governance of the R&I system is clear and straightforward. The Finnish Parliament and the national Government are responsible for the R&I system supported by the Research and Innovation Policy Council (RIC). Most of the public R&D funding (87%) is allocated through two ministries: Ministry of Education and Culture and Ministry of Employment and the Economy. The major funding agencies are the Academy of Finland (scientific research) and Tekes (innovation) being mainly responsible for the project funding.

Public research organisations perform about 9% and the higher education institutions around 23% of all R&D activities in the country. The share of public research funding (0.97% of GDP in 2015, estimate) is quite high. Project funding (57%) exceeds institutional funding (43%), and institutional funding intended especially for universities includes competitive elements. Competition is aimed at improving the quality, but the low rate of internationalisation and dispersed HEI and PRO systems create a challenge to this objective. It also explains the rationale for the Government reforms of the system. There is a trend towards incentivising universities' performance to increase outputs.

International funding has grown since 2011 (17% of GERD in 2014). Most of this is multinational's intramural R&D expenditures. EU funding grew steadily until 2013 but dropped by 4% in 2014. In 2014 it was 2.7% of GERD, mostly FP funding. The role of structural funds in R&D funding is rather minimal.

Smart fiscal consolidation – which seeks to balance Government budgets while protecting R&D investments – remained stable. However, both the structural budget balance and R&D expenditures (GBAORD, government funded GERD) stagnated during the post-crisis fiscal adjustment period of 2010-14.

In 2014, gross R&D expenditures (GERD) totalled €6.5b (3.2% of GDP), with business R&D expenditure (BERD) at €4.4b (2.15% of GDP) and a moderate share of R&D funding from abroad (0.55% of GDP). Although still the EU's top R&D investor, private sector R&D spending declined and so has public funding more recently so Finland does not meet its 4% R&D intensity target.

Key developments in the R&I system in 2015 include:

- New (PM Sipilä) Government, its Strategic Programme and 26 Spearhead Projects
- Continuing revisions of the research system
- Launch of the Strategic Research Council
- Continuing revisions in Higher Education Institution (HEI) funding models
- Decisions to further cut government expenditure on R&D&I: institutional funding for HEIs and Research Performing Organisations (RPOs) and particularly Tekes funding
- Decision to terminate INKA programme and special funding for SHOK programmes
- Further development of Team Finland activities

The Finnish R&I system is addressing the ERA priorities although there is a need for further development. For a small country with limited resources, the European dimension is seen as a logical extension of national policy.

Finland's R&I system has demonstrated successes in knowledge exchange and science-based entrepreneurship, along with a well established venture capital market. The current policy approach includes demand-side measures (such as public procurement for innovation), while the majority is still supply-side instruments. Much emphasis has been placed on increasing the performance of public policies for R&I and internationalisation through joint activities and strategic programmes; the new Team Finland and the Council of Strategic Research are prime examples in that regard.

Finland's R&I system faces the following five challenges:

1. Innovation to boost productivity and competitiveness
2. A new growth mode for public and private R&I investments
3. Swift implementation of R&I policy and governance plans
4. Ensuring a strong science base
5. Increase internationalisation of R&I

Challenge 1: Innovation to boost productivity and competitiveness

Description

Finland faces the combined effects of the global recession and the challenges related to economic transformation and an ageing population. Productivity and living standards still rank relatively high among the developed countries, but especially the positive development of productivity has halted. Since 2008, Finnish exports have declined by approximately one fifth, which is more than in any other advanced economy. The performance of the Finnish economy is lagging far behind most countries in the euro area. Although Finland also has many structural strengths, their impact on the national economy has not been strong enough to pull the country out of the recession ([European Commission, Macroeconomic Imbalances Procedure Country Report – Finland 2015](#)).

In particular, Finland has lost much of its cost competitiveness in global markets for reasons related to the high cost level and losses in multifactor and labour productivity ([Maliranta M, 2014](#), in Finnish). An important factor behind this is the (lack of) flexibility in the labour market. As a consequence, Finnish enterprises have lost their market shares in global markets more than those of any other European country. The impact of Finnish R&I policy measures is deemed to be poor, if at the same time the cost competitiveness does not support the growth and exports of Finnish companies. These challenges call for renewal of existing businesses and creative destruction in the economy.

Converting high R&D investment into medium and high-tech exports (ranked 23rd) is a significant challenge for Finland, while facing low increase in multifactor productivity. Limited investment in non-R&D innovation expenditures (ranked 25th) over recent years could be one explanation for the lack of success in converting the R&D inputs into viable products. On the other hand, it may indicate a lack of innovation, e.g. good investment objects.

Policy measures

Finland's innovation policy and national measures are geared towards speeding up the development, commercialisation and take-up of new technologies and businesses. [The Finnish National Reform Programme \(2012\)](#) and [the latest recommendations of the RIC \(2014\)](#) identified the important reforms needed in research and innovation policy to be the introduction of new means and models to strengthen innovation activity, the establishment of attractive hubs of expertise, internationalisation, structural development of higher education, the reform of research institutes and research funding, infrastructure policy and setting up the tenure track system.

The current Government has shifted the focus of most state aids from direct grants to refundable forms of funding, such as loans, guarantees and equity investments. The Government's objective has been to use business aid to restructure the economy and industry and to boost the internationalisation of companies. At the same time the Government significantly cut R&D grants for enterprises.

Overall, the number and scale of reforms taking place signal a continuous commitment to a broad and ambitious R&I policy. In addition to the efforts to enhance the efficiency and improve the internationalisation of the innovation system, the policy reforms are targeted at increasing the number of high-growth innovative companies as they are considered to be major contributors to employment of tomorrow. The innovative high-growth companies are also considered as a means to diversify the Finnish economic structure. Connected with the growth companies, a temporary tax incentive for private investment in start-ups was introduced, and Vigo accelerators were set up and expanded to increase the volume of the domestic venture capital market. The newly founded Tekes Venture Capital Ltd adopts asymmetric profit distribution mechanisms functioning as the fund of funds. Moreover, Tekes funding has been focused on start-ups. In total, these actions are expected to support especially knowledge- and innovation-based young growth enterprises. What is more, the Finnish Government has recently widened Finnvera's mandate in business and encouraged innovation and the country's transformation into a digital service economy by releasing non-sensitive public data as open data.

Targets of the new Government Programme related to innovation are i) strengthening competitiveness by improving conditions for business and entrepreneurship by reforming key legislation and removing sectoral regulation that prevents competition, ii) strengthening cooperation between higher education institutions and business to bring innovations to the market, iii) aiming at deregulation and the reduction of the administrative burden as well as iii) creating a culture of experimentation especially by increasing, innovative public procurement.

Assessment

Improving the economic competitiveness and reforming the research and innovation system are at the top of the political agenda of the current Government. Most of the Government Programme's strategic objectives and specific plans (spearhead projects) are closely relevant to these goals. The target to increase the share of innovative public procurement up to 5% is a strong incentive for innovation, although the means to reach the target have not been defined. As objectives, these are welcomed from an R&I policy perspective. However, there are significant further cuts to the government research and innovation funding especially on its priority areas. The incentives for business – higher education cooperation will mostly be cut. In many respects, the focus of these cuts is not aligned with objectives in the Government Programme (cf. previous section).

The planned actions on cutting red tape and rigidities of the labour market are equally important and likely to improve the productivity and competitiveness. But in the long-term, significant productivity and competitiveness improvements will require also systematic investments in knowledge and innovation.

Despite introducing significant cuts to public R&D expenses, the new Government Programme aims to enhance the funding, equity capital and risk-taking capacity of start-ups and YICs. The cuts to Tekes' budget are likely to harden the funding for large businesses and research organizations as the needs of young companies and SMEs will be prioritised. Combined with the additional investments to Tekes Venture Capital Ltd, it is evident that the focus of the Finnish R&D system will further shift towards start-ups and YICs in the coming years.

Finland has made some progress in boosting its capacity to deliver innovative products. Policy programmes for new growth areas, such as clean technology, biotechnology and digitalisation are promising but still relatively small-scale.

Health technology is a business sector where progress has been very positive. The sector has been able to grow during the recession and was in 2014 the largest high-tech sector in Finland. Recent success stories can be found also in the ICT related service sector, with an increase in turnover by 8 % in 2013–2014². This was achieved mostly due to the gaming (entertainment) industry, with 70 % of its companies being established in the last 5 years (Tekes, 2015). These industries require only modest investments in physical capital, but a well-functioning infrastructure for all companies in the service sector is a necessity.

Implementation of the new university funding model is a good step forward in rewarding for quality and internationalisation, but incentives for creating socio-economic impacts are not yet in place. Nonetheless, the Government has made important policy initiatives focusing on structural reforms to improve the sustainability of the public finances, the most significant of the reforms being pension and health care reforms. These aim at fiscal consolidation, and increasing the labour supply. The reforms were necessary, but the weak trend in the economy indicates that reforms have not significantly raised the productivity. Major decisions in many areas of policy are needed both now and in the years ahead.

An area in which decision-making is needed is the reduction in production costs relative to Finland's trading partners. Moreover, the need for removing regulatory controls that limit competition and innovation still remains. New means are especially needed to increase multifactor and labour productivity of the whole economy by introducing R&I measures which aim at broadening the innovation base, and increasing the incentives for R&I and risk-taking of businesses and capital.

Challenge 2: A new growth mode for public and private R&I investments

Description

In 2014, Finland's gross expenditure on R&D (GERD) was €6.5b, representing a good 3.17 % share of the GDP. Particularly the business of R&D expenditure (BERD) was high, being €4.4b and representing 2.16 % share of GDP (67.7 % of the total). The share of R&D funding coming from abroad was moderate 0.38% in 2013 up to 0.55 % of the GDP in 2014.

Finland is the EU's top R&D investor, but the recent declining trend of both public and private R&D investments may have a negative impact. Statistics Finland's GERD estimate for 2015 is 3.1 %. In particular, the share of business-relevant research is not high, and has been cut significantly over recent years. According to RIC, the government funding for R&D for boosting the knowledge base and the renewal of industries declined by 35% during 2011–2014. The Government proposed budget allocations for 2016 show a continuation, if not strengthening, of the recent trend of R&I budget cuts. The proposed³ reductions in Government R&D budget allocations for 2015–2016 are in total of €153m, representing an overall 8% cut in the budget from 2015.

Furthermore, the actual performance of the R&D system in terms of efficiency (inputs to outputs) places Finland much lower down in the comparisons (ranked 23rd) ([Edquist & Zabala-Iturriagagoitia, 2015](#)). There are several factors behind this; many of the R&D investments in Finland are not aimed for economic impact, often the economic impacts are only moderate, and the statistics are dominated by few leading companies (e.g. Nokia). The average R&D investments of other than the leading companies are merely average and those of SMEs even below that.

² http://www.tilastokeskus.fi/til/yrti/2014/yrti_2014_2015-09-24_tie_001_en.html

³ Calculations of the Research and Innovation Council on 8.10.2015, based on Government Budget Proposal for 2016.

Measures

Finnish policies well acknowledge that the emergence of new R&I intensive sectors and growth companies are crucial for the future economic and societal well-being of the country. The debate on how to address flagging technology exports, weak productivity growth, and diversification in business R&D is ongoing, involving major national stakeholders. A number of measures have already been taken to address this complex challenge. These include addressing the supply side measures – a number of key actors are involved such as the Research and Innovation Policy Council (RIC), Tekes and the Ministry of Employment & the Economy (MEE). The outcomes so far include R&I recommendations 2015–2020 by the RIC (2014); the action plan and policy framework for demand and user-driven innovation by MEE; the reform of the Act on Public Procurement, so that public procurements pay greater attention to innovation (2015); a joint-service 'Growth Track' intended for enterprises aiming at rapid growth and internationalisation; the 2013 Tekes funding concept (2014–2017) for young, innovative enterprises and new companies VC - start-up ecosystem; the enlargement of Finnvera's mandate; the expansion of the Vigo Accelerator Programme; a tax incentive for private investors; an ICT 2015 working group's (2012) strategy to mitigate the effects of the sudden structural change; the new strategy of Tekes with emphasis on growth companies; establishment of Tekes Venture Capital Ltd fund of funds with the possibility of asymmetric distribution of profits; and the governmental decision on central government spending limits for 2014–2017 in April 2013. Moreover, the Smart Procurement Programme (2013–16) aims to create new market opportunities for SMEs and produce ground-breaking innovative solutions to serve the needs of the Finnish public sector. Finally, Finland's smart specialisation strategy, which could serve to increase business investments in R&D at regional levels based on their comparative advantages, is in progress.

Assessment

The focus of public R&I funding has been effectively shifted to SMEs, which are growth-oriented, job creating and successfully establishing international connections. Incentives for the cooperation between businesses and public research organisation have also worked well. Despite the low level of these incentives, Finland ranks 1st in cooperation. Due to cuts in 2011–2014 and the new decisions by the government, the level of incentives for cooperation, and public funding allocations to research boosting growth and competitiveness of companies will remain modest, and incentives for business R&I will remain on a low level compared to competing economies (OECD, Science, Technology and Industry Outlook 2014)⁴. The government's decision to shift the focus from direct grants to refundable forms of funding do not increase R&D investments of businesses. A lack of know-how in dismantling units of PROs, and functions and renewal through reallocating resources is also hindering the progress for efficiency (RIC, 2014). Finland's smart specialisation plans could offer greater clarity, stronger focus and resource allocation as well as include advanced monitoring and evaluation mechanisms. The proposed⁵ reductions in government R&D budget allocations for 2015-2016 total €153m. The cuts in funding for universities and public research organisations will decrease public R&D investments but may increase strategic focus and the scientific excellence. Despite the good targets of the government, there are few practical means to increase R&D investments in Finland and it seems evident that Finland is not able to meet its official 4 % R&D intensity target.

⁴ http://www.keeper.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-outlook-2014_sti_outlook-2014-en#page69

⁵ Research and Innovation Council, 8.10.2015.

Challenge 3: Swift implementation of R&I policy and governance revisions

Description

Further to the evaluation of the whole innovation system (2009), a number of institutional evaluations were launched, pointing out a number of structural challenges. The Finnish government attempted to respond to these challenges during the past 5 years. A number of specific evaluations and studies have been conducted to address the structural challenges of the research and innovation system, and equally many systemic changes are still in process.

At the level of policy-making, greater coordination is needed to address new and complex R&I challenges in Finland. In the administration of research and innovation, there are some systemic difficulties in making strategic choices, improving the quality of research outputs and developing measures to support new sources of R&D based growth. On the other hand there is a high degree of transparency and data availability, as well as an evaluation and monitoring system in R&I policies to support improvements in governance.

One of the biggest revisions in the current Finnish R&I system has been the university reform (2010), followed with the Polytechnic reform (2011) and reform of the research institutions and research funding (2012). These were immediately followed with a new university funding model (2013), just to name a few. The major R&I funding agencies (Academy of Finland & Tekes) have recently been evaluated and their roles have been adjusted accordingly. Furthermore, new organisations, such as the Council for Strategic Research and the Team Finland concept have been established. Many, if not most, of these revisions will take several years before the organisations are functioning with full efficiency and have found their new roles in the system. Changes particularly in the university sector and research institutions have been slow to take their full effect.

Policy measures

The government is carrying out the Central Administration Reform Project (KEHU) to improve coordination and coherence in government. The Research and Innovation Council (RIC) established new guidelines 2014–2020 aiming to improve the R&I system and governance. The Finnish government also adopted a Resolution on Comprehensive Reform of State Research Institutes and Research Funding in September 2013, which aims to increase multidisciplinary, high-level research of societal relevance and research to support government decision-making. The resolution covers reorganisation of public research institutions and reallocation of some public research funding to competitive research funding. It also created a new, Strategic Research Funding Instrument within the Academy of Finland to support long-term research on challenges facing Finnish society. The government's funding arrangements for 2015 involve a reduction of €22m for public research organisations compared with their allowance for the previous year in order to support strategic research via the SRA (Research Europe, 2015). The Team Finland Strategy is becoming an essential element of Finnish STI policy and will be updated annually with emphasis placed on stability and continuity to maintain its long-term perspective.

Assessment

As stated before, it is seen very positive that reforming the national research and innovation system is among the strategic objectives of the new Finnish government. For many parts, in practice this is likely to mean the follow-through of the revisions planned and started earlier, namely: Central administration reform; Continuing revisions of the research system; Launch of the Council for Strategic Research operations; Continuing revisions in the university funding models; Further development of Team Finland activities.

At the same time, the volume of specific government measures to this end (spearhead projects) is quite marginal compared to decisions and budget cuts introduced in the R&I sector, namely decisions to further cut government expenditure on RDI, (including Tekes funding to key programmes). Furthermore, the decision to further shift the allocation of existing funding from grants to returning instruments (loans, guarantees, VC) will have an additional impact on the overall functioning of the business R&D incentives, moving the balance from competence building to close-to-market activities.

An evaluation of the RIC was conducted to support the development and strengthening of its operations. It made a number of recommendations to meet the needs of a changing operating environment (including increasing funding, use of foresight and assessments, use of external experts and stakeholders, involving sectoral ministries, reinforce transparency, and positioned under the Prime Minister's Office). In March 2016 (with an effect from April 1st), the Finnish Government approved an amendment to the decree of the Research and Innovation Council (RIC). According to the new amendment, the composition of the council will be reduced (the maximum number of ministers reduced from nine to four) and its tasks will be more strategic and pre-emptive than before. The Council will be headed by the Prime Minister, and supported by the key research ministers; the Minister of Education, Science and Culture and Minister of Employment and the Economy. It is noteworthy that the Council Secretariat will cease to exist and the preparatory tasks will be assumed by the ministries, Tekes and the Academy of Finland.⁶

Coordination and cooperation between funding agencies aims at more streamlined services for companies, and new co-funding models, increasing diversification and supporting growth businesses. These new policy developments should help spur important structural and financial changes in support of improved R&I governance. Such coordination mechanisms may foster new approaches to support research and innovation to contribute to sustainable growth, for example in the clean tech and bio-economy areas. Such long-term measures with strong monitoring and evaluation frameworks, as well as experimental approaches, support future R&D-driven economic growth. At the same time when assessments and evaluations are increased, the government strengthens its own policy intervention, which may discourage operational public-private partnerships to find focus and allocate resources. The need to improve the quality of assessment and evaluation measures grows as their role becomes stronger. The needs are especially related to indirect impacts, long term effects and counter-factual analyses.

Challenge 4: Measures to improve the quality of science

Description

An important area for improvement is Finland's leading-edge research. While overall the inputs to the science base are strong, scientific performance has remained flat since 2000 as other countries' progressed. Despite outperforming the EU, US and many others in terms of R&D investments (ranking 4th for private and public R&D investments among OECD countries) and on shares of new doctoral graduates, increasing input has not yet translated in terms of growth in scientific and technological output. The weaknesses in the system include the range of scientific disciplines at universities and research organisations, which are similar to, or overlapping with other universities. Specialisations in key or strategic fields have not been sufficiently pursued in the current system, resulting in low numbers of researchers at the top of their field. Most Finnish universities reach a mid-level in the international university rankings (Times Higher Education Ranking (?), Shanghai index - though partly due to their approach on a few fields of excellence, and the size of universities), and Finland is weak in top publications or excellence rankings (14 % of publications in top 10 % highly cited, compared with Sweden 15 %, and 70 on the Research Excellence Indicator, against Sweden's 88 score).

⁶ <http://www.minedu.fi/OPM/Tiedotteet/2016/03/TIN.html?lang=fi>

Related to this, Finland's regional policies may have also affected its ability to reach scientific excellence with several universities originally established in remote locations with low local demand, and a lack of specialisation to attract top talents or to develop comparative advantages.

Finland has not been able to improve the quality of its research in comparison to other countries, when measured with citation indices. The core of the challenge is related to the fragmented research resources (universities and research performing institutions) and partially to the lack of international mobility of research (in particular the mobility of researchers and the utilisation of international funding opportunities). To this end, Finland is at the average level among EU countries. The current government wishes to address this through the reform of the research system and by setting budget incentives of the universities. Also the government budget cuts are aimed at encouraging stronger specialisation and strategic choices at the universities and research institutions. The relevance of the public research for innovation and the economy of the country is not measured, although there is a strong evaluation culture.

Policy measures

A number of measures in recent years aim to increase the quality of the science base through structural changes, improving financial incentives and reforming the financing models. These include the new University funding model (2013), the structural development scheme for polytechnics implemented in 2014, the reform of research institutes and research funding (starting 2014) including the establishment of Council of Strategic Research (SRA) in 2014, the R&I recommendations for 2015-2020 by the Research and Innovation Council, the Finnish Research Infrastructure Committee, updated Finland's national roadmap for infrastructures 2013. Furthermore, in 2009, the Academy of Finland found that the country has too many centres of excellence for a country of its size, and recommended mergers to form larger centres to help solve the problem of funding being spread too thinly.

Assessment

Clear results can only be assessed in the longer term, though science quality has shown improvement as a result of excellence-driven funding models and advances in structural reforms of funding agencies, research institutes and universities. Some mergers have also taken place. To date, the means for coordinating and strengthening universities' strategic choices have been soft and results have been achieved quite slowly. The government has reallocated €50m from universities' institutional funding to competitive funding (Academy of Finland), and decided further cuts to university funding. These measures may boost the process.

Challenge 5: Increasing the internationalisation of R&I

Description

Success in science, research and innovation is becoming more global in terms of collaboration, and access to human as well as financial resources. However, the degree of STI internationalisation in Finland is quite weak, affecting both public and private sectors. Finland shows moderate levels of international funding for R&D (17 % of GERD in 2014) although it has been growing (235 % increase in 2010–2014, Statistics Finland, 2015)⁷. Finland's volume of stocks of foreign direct investment (FDI / GDP) is at 38 % in 2014, being also lower than in other leading countries. The share of foreign doctoral students is also low (e.g. 7 % of doctoral graduates have a citizenship of another EU member state , and 7 % of a non-EU, compared with 11% and 22% respectively in Sweden (Deloitte, 2014). And, while levels of international co-publications are increasing, international co-patenting is below the levels of its peers.

⁷ http://www.tilastokeskus.fi/til/tkke/2013/tkke_2013_2014-10-30_tie_001_fi.html

While Finland's performance in the Innovation Output Indicator has been very good (ranked 5th) it underperforms on measures of exports in medium and high-tech, indicating a decline in competitiveness. Finland's participation in EU research programmes is also below potential in most areas, particularly in areas where Finland's track record is good. Taken together, this means that Finland is held back from developing leading-edge innovations that can sustain domestic investment and growth ([EC Innovation Output](#)).

Policy measures

Finland is committed to addressing the weak internationalisation of its science base. In five years (2007–2012) the share of foreign students in universities increased by 75 % from 3.3 % to 5.8 %, but the level is still very low. In 2012 the share of new foreign student was 12 % and the share of foreigners among doctorate graduates 18%, ([Finnish National Board of Education \(FNBE\), Statistical services](#)). In 2010–2013 foreigners' share of all recruited professors was 14 %, ([The Academy of Finland, The State of Scientific Research 2014](#)). Co-publishing with foreign researchers has increased slowly but continuously, being 52.7 % (% of total) in 2012 (rank 12th among OECD). The share of foreign private R&D investments as a share of private R&D in Finland was 20 % in 2014 ([Statistics Finland 2015, Research and development 2014](#)), which is moderate in international comparison, but is mainly explained by the low share of foreign affiliates of total entrepreneurial activities in Finland.

To support EU programme participation and broader internationalisation, the University funding model reforms in 2013 sought to increase incentives for internationalisation. The Finland Distinguished Professor Programme (FiDiPro) scheme was established to attract high level foreign talent to Finland. Finally, venture capital funding through the Vigo Accelerator and by YIC funding scheme aims to attract foreign investment for start-ups in Finland. Finland slightly increased its applications to H2020 compared with FP7, though saw a slight decline in signed grants.

The Team Finland strategy for promoting foreign investment, adopted in December 2012, aims to exceed the EU average in the stock of FDI as a share of GDP (46.6 % in 2012) by 2020 from its current level (38 % in 2014). This strategy seeks to improve the efficiency of existing FDI promotion efforts by bringing them under a single umbrella. It aims to create a clear, flexible and customer-oriented model so that key domestic and abroad actors work towards a coherent goal. In addition, international companies conducting R&D activities in Finland can apply for Tekes' funding even without being registered in Finland or having a Finnish partner (OECD2014), assuming and requiring that there are economic impacts anticipated in Finland.

Assessment

Up until now, the overall progress with regard to increasing the internationalisation of R&I in Finland has been modest, although for some schemes it is too early to assess. In terms of attracting foreign human expertise, schemes like FiDiPro continue to enhance the international dimension of universities and research institutes. The low share of foreign R&D in the private sector is partially explained by the Finnish business structure, having few foreign affiliate companies. Although there is some notable progress, the pace is still slow. The slow progress may reflect the lack of internationalisation of the economy and society as a whole, including immigration policies. Finland should continue to foster participation in EU programmes to support its internationalisation aims.

1. Overview of the R&I system

1.1 Introduction

Finland is a sparsely inhabited country in Northern Europe with 5.5 million inhabitants, accounting for 1.07 % of the EU population. By land mass Finland is the 8th largest country in Europe. Economic growth in Finland has been slow for a prolonged period. In recent years, growth has been depressed not only by the weak international economy, but also by sectoral and structural problems, such as an ageing population and lacklustre productivity development. Finland's Gross Domestic Product (GDP) has been declining continuously since the second half of 2012. GDP at market prices was €205b in 2014 and GDP per capita €37,600, 37 % above the EU-28 average (Eurostat, Statistics Finland, Annual national accounts, 2014)⁸. The performance of the Finnish economy is lagging well behind most countries in the euro area. Finnish export market shares decreased in most product categories between 2000 and 2013. The cumulated loss in market shares amounts to more than 32 % between 2008 and 2013, which is the largest in the EU-28 (EC; Macroeconomic imbalances Country Report – Finland 2015)⁹. Production costs in Finland have increased due to an approximately 10 % rise in average wages relative to the euro area average since 1999, when the common currency was adopted. Most of the difference in average wages has come since 2007. Unit labour costs have also risen by approximately the same amount across the economy as a whole relative to the euro area average.

The turnover of the electronics sector collapsed 2009–2013 by 48 % (at current prices) led by Nokia's tumble in the mobile phone market and its acquisition by Microsoft in 2014, causing a remarkable decrease in the share of high tech industry. The erosion of wood and paper production has been more gradual but remarkable: 9 % at current prices. The chemical and metal sectors have been more resilient, but have been unable to make up for losses in electronics and forestry. Services have not compensated for losses in output and exports in manufacturing (OECD 2014, Economic survey¹⁰). In 2015 health technologies is the largest high tech sector in Finland. It's turnover and export has grown steadily even since 2008, but it has not been able to compensate the effect of Nokia's tumble. Medium low-tech industries are dominating in manufacturing. Employment as the share of total employment in HT (High Tech) and MHT (Medium High Tech) industries has fallen from 6.0% in 2008 to 5.0 % in 2014¹¹. Employment in knowledge-intensive activities as the share of total employment has been quite stable (37.2 % in 2014)¹². Trade with Russia has declined remarkably due to the conflict in Ukraine and sanctions by the EU and Russia. The rapid decline of electronics and forest industries has largely ended.

The Finnish economy is very weak and faced with many challenges. According to the Bank of Finland forecast (Bank of Finland Bulletin 5/2015)¹³ GDP will contract by 0.1 % in 2015. Growth will reach 0.7 % and 1.0 % in 2016 and 2017, respectively. In the forecast years, GDP in Finland will improve only by a total of 1.6 %, while growing in the euro area by 5.1 % over the same period. Investment in Finland has been contracting for several years. Developments have been much weaker than in competing countries and the euro area as a whole. In 2015, Finland saw some signs of investment recovery and expectations have risen, with a slight upturn in investment forecast for 2016–2017.

⁸ http://www.stat.fi/til/vtp/2014/vtp_2014-07-09_tie_001_en.html

⁹ http://ec.europa.eu/economy_finance/publications/occasional_paper/2015/pdf/ocp225_en.pdf

¹⁰ http://www.oecd.org/eco/surveys/Overview_Finland_2014.pdf

¹¹ <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>

¹² <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>

¹³ <http://eurojatlous.studio.crasman.fi/file/dl/ii/OEAdtg/EdEvXhujwKhHLho6EPJNCw/B515.pdf>

The recovery in Finnish exports has been delayed and is lagging behind the progress of exports in competing countries, although increased investment in the euro area will support export growth. Global growth prospects have deteriorated, particularly in the emerging economies, bringing uncertainty to the budding growth. The depreciation of the euro will facilitate exports to countries outside the euro area. The decline in employment and increase in unemployment appear to have flattened out, but labour market conditions will improve only slowly in the forecast period. Subdued economic growth and high structural unemployment will slow the improvement in employment, and unemployment will remain high. Finland's public finances will continue to post a deficit of close to 3 % during the forecast period, and the public debt will increase further to 68 % of GDP in 2017. The forecast takes account of the new government's budget proposal for 2016 and measures envisaged for 2017.

The government published the budget proposal 2016¹⁴ and the general government fiscal plan for 2016–2019 as well as the Economic survey (Ministry of Finance publications – 32c/2015; Economic Survey, autumn 2015)¹⁵. They include projections of Finland's economic outlook for 2015–2019, and the central government spending limits, which provide a binding four-year framework for the entire parliamentary term. It also constitutes Finland's stability programme and meets the EU requirement for medium-term budget planning. The survey states that the Finnish economy is in an extremely difficult situation. It is projected that the level of industrial output in 2017 will be one-quarter lower than 10 years ago.

The combined impact of the economic recession and Nokia's fall caused a remarkable decline both in public and private R&D investments. There is evidence to suggest that productivity growth by the latter is no longer supported as it was in the past. R&D investments have declined in Finland since 2011 from €7,164m to €6,512m in 2014 (Statistics Finland), and GERD (as % of GDP) has declined since 2009 when it was 3.75 % to 3.17 % in 2014. The estimate for the year 2015 is 3.1%. R&D expenses of the electronics sector decreased 2009–2014 more moderately than the turnover, by 28 %. However, R&D expenditure of the wood and paper sector declined only 6 %. Although other companies in other sectors increased their R&D expenditures, BERD has decreased by 9 % in 2009–2014 (Statistics Finland 2015, Research and development 2014)¹⁶. In 2015 Finland's GERD (as % of GDP) was far below the unrealistic target set by the government (4 % in 2020). In 2014 GERD performed by BES (Business Enterprise Sector) as a % of GDP was 2.14 %, performed by GOV (government) 0.30 % and performed by HES (Higher Education Sector) 0.73 %. Governmental R&D funding increased during 2006–2010 by 15 % in real terms but declined during 2010–2014 by 13 %, increased in 2015 by 0.6 % and will decline again in 2016. The Research and Innovation Policy Council (RIC) has reported that the government's funding for R&D for boosting the knowledge base and the renewal of industries declined by 35 % in real terms during 2011–2014. With the new government programme (see Chapter 2) the moderate share of turnover from innovation (11 % in 2012) is unlikely to improve.

Although the situation in Finland is challenging, productivity and living standards still rank high among the developed countries, the Finnish economy is knowledge-intensive, and has achieved a state of a continuous change towards a high- and medium-high-tech specialisation. The country has several hot-spot clusters, which compare well internationally, in particular in the ICT, forestry, metal products and machinery, environment, materials, energy, wellbeing, and food and agriculture sectors.

¹⁴ <http://budjetti.vm.fi/indox/index.jsp> (in Finnish)

¹⁵ <http://vm.fi/documents/10623/1106796/Economic+Survey+Autumn+2015/a442a986-8763-4d65-891d-8abc75dd9f93?version=1.0>

¹⁶ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true

Finland still ranks also among the World's best in the R&D intensity (Eurostat) and competitiveness (WEF; The Global Competitiveness Report 2015 – 2016)¹⁷, in terms of scientific and technological excellence and innovation (The EU IUS - Innovation Union Scoreboard 2015)¹⁸ and (GII - Global Innovation Index 2015; Cornell University, INSEAD, and the World Intellectual Property Organization WIPO)¹⁹. IUS states that Finland is an innovation leader (3rd), and its innovation performance steadily increased until 2012, after which it has slightly declined Finland's performance relative to the EU has been declining from its peak of 30 % above the EU average in 2007 to 22 % in 2014. Thus, Finland is slowly losing its positions as one of the leading countries in innovation. According to Global Innovation Index Finland ranks 6th. The cuts in funding education and research by the government^{20 21 22} will continue the trend. Some cuts are justifiable having as target to increase the quality of the Finnish research system by unifying the dispersed research system, but some have raised concerns about the cuts in funding for building the knowledge-base needed by industries and boosting industrial research.²³

Although measures for improving cost competitiveness are important, they may not be enough for Finland's future success where stronger investments in innovation, and incentives for such investments are needed to boost multifactor productivity.

Table 1. Main R&I indicators, 2012-2014.

Indicator	2012	2013	2014	EU (2014)
GDP per capita	36,900	37,300	37,600	27,400
GDP growth rate	-1.4	-1.1	-0.4	1.4
Budget deficit as % of GDP	-2.1	-2.5	-3.3	-3.0
Government debt as % of GDP	52.9	55.6	59.3	86.8
Unemployment rate as percentage of the labour force	7.7	8.2	8.7	10.2
GERD in €m ²⁴	6832	6684	6512	
GERD as % of the GDP	3.42	3.31	3.17	2.03
GERD (EUR per capita)	1265	1232	1195	558
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	5.2	5.2	5.1	5.7

¹⁷ <http://reports.weforum.org/global-competitiveness-report-2015-2016/>

¹⁸ http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015_en.pdf

¹⁹ <https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2015-v5.pdf>

²⁰ Finland, a land of solutions, Strategic Programme of the Prime Minister Sipilä's Government 29 May 2015, Government Publications 12/2015

²¹ Action plan for the Spearhead Projects of the Government Programme: <http://valtioneuvosto.fi/en/implementation-of-the-government-programme/information>

²² http://budjetti.vm.fi/indox/tae/frame_year.jsp;jsessionid=655A4CAD6AF8A3DCA20153E3FEACCE76?year=2016&lang=fi

²³ http://www.minedu.fi/export/sites/default/OPM/Tiede/tutkimus-ja_innovaationeuvosto/julkaisut/liitteet/Review2015_2020.pdf

²⁴ https://www.tilastokeskus.fi/til/tkke/2014/tkke_2014_2015-10-29_tie_001_en.html

Employment in knowledge-intensive service sectors as share of total employment	45.0	44.6	44.9	39.8
Turnover from innovation as % of total turnover	11.1	NA	NA	11.9 (2012)
Value added of manufacturing as share of total value added	27.3	NA	NA	26.2 (2012)
Value added of high tech manufacturing as share of total value added	1.5	NA	NA	2.5 (2012)

(Data: Eurostat)

1.2 Structure of the national research and innovation system and its governance

1.2.1 Main features of the R&I system

Regarding the Finnish governance system, it is centralised in terms of national guidelines, strategies and funding but a mix of national and local administration allows regions to have a relatively high degree of autonomy in the design and implementation of regional policies. Regions' role is especially focused on allocating structural funds. Municipalities are also active in boosting entrepreneurship and start up ecosystems by their business promotion offices or companies. Innovation policies and strategies are led by the Finnish government, which decides on national development goals and sets the general guidelines. On the other hand funding agencies, universities and research institutes have substantial freedom of creating and implement their strategies. Finally, it has been a long-term trend to increase competition in the research system continued during the current and two previous governments.

The role of the private sector in the Finnish R&I system is strong. The share of GERD performed by the BES (Business Enterprise Sector) was 68 %, and 66 % was funded by the BES in Finland in 2013 despite the recent decrease of the share (Statistic Finland 2015). Public research organisations perform about 19 % and the higher education institutions around 23 % of all R&D activities in the country. There were 4,425 foreign affiliates in Finland in 2014 covering about 23 % of the turnover of all companies²⁵, and 17 % of the Business sector R&D expenses²⁶. SME's role in R&D is not very strong; their share of R&D expenditures was 23 % in 2014²⁷.

1.2.2 Governance

The Finnish research and innovation system is divided into four operational levels as illustrated in Figure 1. The Parliament of Finland and the Finnish government rule the highest level. In matters related to research, technology and innovation policy, the latter is supported by a high-level advisory body, the Research and Innovation Policy Council (RIC). The RIC gives recommendations for the strategic development and coordination of Finnish research and innovation policies and is led by the Prime Minister. The government is strengthening its role in R&I policy. The Prime Minister's Office monitors the implementation of the government Programme and produces material for government's strategy sessions.

²⁵ https://www.tilastokeskus.fi/til/ulkoy/2014/ulkoy_2014_2015-12-18_tie_001_en.html

²⁶ https://www.tilastokeskus.fi/til/tkke/index_en.html

²⁷ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true

The coordination of the state's sectoral research in support of decision-making is one of the Prime Minister's Office's responsibility areas (see Chapter 2.2).

As part of the government Resolution on Comprehensive Reform of State Research Institutes and Research Funding (2013) the government annually adopts a plan for analysis, assessment and research in support of its decision making to steer studies and research towards specific priority areas selected by the government. The aim is to create a basis for systematic and broad-based use of research data in decision-making, steering and operating practices.

The second level consists of the ministries, of which the Ministry of Education and Culture ([MEC](#)) and the Ministry of Employment and the Economy ([MEE](#)) play the main role in research and innovation policy. MEE is responsible for planning and budgeting innovation policy. MEC is responsible for the matters related to higher education and science policy. Together these ministries account for 87 % of the governmental research and innovation funding. In 2016, the share of MEC of governmental R&D was 60 % while that of MEE was 27 %. The share of MEC has increased during recent years mainly due to additional funding to the Academy of Finland, and cuts in funding of VTT and Tekes (Statistics Finland; R&D funding in state budget 2016)²⁸.

On the third level of the Finnish Innovation system, there are the competitive R&I funding and the R&D funding agencies, Academy of Finland, Tekes - the Finnish Funding Agency for Innovation, Sitra - the Finnish Innovation Fund and state owned financing companies Finnvera and TESI, Finnish Industry Investment Ltd (FII).

[Academy of Finland](#) provides funding for scientific research and training researcher, and aims at improving research capacities. Academy's funding decisions are budgeted to amount to €439m in 2016 (a 4 % increase from 2015) (Statistics Finland; R&D funding in state budget 2016).

[Tekes](#) - the Finnish Funding Agency for Innovation funds for applied research in universities, research institutes and large companies, provides competitive grants and loans for development and innovation in SME's, grants and loans for YIC's (Young Innovative Companies). Tekes also funds start-ups, and through Tekes Venture Capital Ltd, a fund of funds, contributes to seed phase VC-investments. A special target of Tekes funding is to build incentives for cooperation and knowledge interaction. Funding decisions of Tekes are budgeted to amount to €381m in 2016 (a 23 % decrease from 2015 (Statistics Finland; R&D funding in state budget 2016). Centres for Economic Development, Transport and the Environment ([ELY Centres](#)) are responsible for the regional implementation and development tasks of the central government. They also provide Tekes' services to the regions.

[Sitra](#), the Finnish Innovation Fund operates directly under the parliament having high autonomy. Sitra's mission involves foresight of societal change, studying megatrends and promoting evidence based decision making, trying out new operating models and accelerating business activities by pilots and VC-funding. Sitra operates with the profit it earns from the investments of its own capital. In 2014, Sitra's total long-term assets were €739m and total expenses €31m (Sitra, Annual Report 2014)²⁹.

[TESI](#), Finnish Industry Investment Ltd (FII) is a government owned special purpose investment company. The value of assets under the management of FII is €901m (FII, Annual Report 2014)³⁰.

²⁸ http://www.tilastokeskus.fi/til/tkker/2016/tkker_2016_2016-02-25_tie_001_en.html

²⁹ <http://www.sitra.fi/en/news/organisation/sitras-annual-report-2014-future-built-taking-action-today>

³⁰ <http://www.industryinvestment.com/news-and-publications/annual-reports>

[Finnvera](#) Ltd is a specialised financing company owned by the State. Finnvera provides financing for the start, growth and internationalisation of enterprises and guarantees against risks arising from exports. Finnvera's SME financing issued in 2014 was €1b and export credit guarantees and special guarantees €5b (Finnvera, Annual Report 2014)³¹. Finnvera's outstanding commitments (31 December 2014) were

- SME Financing €2.8b
- Export Financing €12,2b

[Finpro](#) has three focus areas: Export Finland, Invest in Finland and Visit in Finland. It helps Finnish SMEs go international, encourages foreign direct investment in Finland and promotes tourism having a role in many innovation processes of enterprises including supporting export activities and market foresight. Preparations started in 2015 aiming at changing Finpro from a registered association into a fully state-owned company.

The fourth level is comprised of organisations that conduct research: universities (14), public research organisations (12) and polytechnics, also known as universities of applied sciences (26) and of course private companies. Implementation of the University Reform (the new University Act 2010) has been completed. The Polytechnic Reform was recorded in the Government Programme in 2011. A new Polytechnics Act took force in 2014. Further, according to the Government Programme, the responsibility for polytechnic funding as a whole will be transferred to the government, and polytechnics will be made independent legal persons. The licence to provide polytechnic education will be revised, with emphasis on quality and impact. Polytechnic financing will be overhauled to better support current objectives, such as speedy transfer to the labour market. The polytechnic units will be combined into sufficiently large and innovative high-standard competence environments. There will be one or more polytechnics in every province. Evaluation of the effects of the new University Act 2010 and Polytechnics Act 2014–2015 has been initiated³².

Evaluations are used extensively to guide political decision-making and to assess the operation of individual organisations and programmes. The government has strengthened its resources to support the government's strategic decision-making. The Prime Minister's Office monitors the implementation of the government Programme and produces material for government's strategy sessions.

A stable centre-of-government R&I structure is in place in Finland, providing a quite predictable policy and budgetary framework on a multi-annual basis ensuring a coordinated implementation. However there are challenges related to the methods and relevance of the evaluations. Public R&I policy is backed up by networks involving all relevant stakeholders, such as industry, regional and local authorities, parliaments and citizens. This is the case both on the political level as well as and especially on operational level. The new government has, however, not yet defined clearly its R&I strategies.

The Finnish National Innovation System was evaluated in 2009 and all the major actors in 2010–2014 including the RIC. These evaluations also include the evaluation of main funding instruments, which in many other countries are called programmes. In 2013, the MEE ordered [a Study on the Impacts of the Evaluations Made in 2009–2014](#) (in Finnish). In these evaluations a total of 157 recommendations were made. According to the study, 80 % of the recommendations have proceeded to an operational execution phase (42 % completed, 41 % in progress), 7 % were assessed to be irrelevant, and 10 % were not put into practice for various reasons.

³¹ <http://annualreport2014.finnvera.fi/en/financial-statements/report-of-the-board-of-directors.html?openmenu=true>

³² http://www.minedu.fi/OPM/Koulutus/koulutuspolitiikka/Hankkeet/Yo_ja_amk_uudistusten_vaiikutusten_arviointi/index.html

So it seems that the culture of evaluations supporting evidence-based decision-making is working. In March 2016 (with an effect from April 1st), the Finnish Government approved an amendment to the degree of the Research and Innovation Council (RIC), based largely on the previous evaluation of RIC.³³

The funding agencies Academy of Finland and Tekes have a long history in doing evaluation. The Academy of Finland evaluates the state of the science in Finland every second year, as well as, many of its programmes. [The state of the scientific research in Finland 2014](#) reviews the state and the position of the Finnish research system, comparing it internationally. Tekes evaluates all of its programmes and instruments (including mid-term and ex-post evaluations) and has integrated impact assessment into yearly strategy and management process (Saarnivaara V-P, Uusikylä P, 2014, [Impact Evaluation - Finnish Experience](#)). The evaluations made since 2012 are listed in Annex 3.

1.2.3 Research performers

Higher Education Institutions (HEI) includes universities, polytechnics and university hospitals. In 2014, universities' share of the R&D expenditures was €1276m, polytechnic's share €151m and university hospitals' €63m³⁴. GERD as a % of GDP performed by HEIs was 0.73 % in 2014. Concerning the institutional funding, two thirds of university budgets is allocated to education and one third to research ([Research in higher education institutions](#)). At polytechnics, according to the Statistics Finland, only 8 % of the budget has been allocated to research but the new funding model will allocate 15 % of the budget to research ([Finnish National Board of Education, MEC Funding 2014](#), in Finnish).

GERD as a % of GDP performed by PROs was 0.30 % in 2014. There is one RTO (Research and Technology organisation) in Finland: VTT (Technical Research Centre of Finland) under the MEE (Ministry of Employment and the Economy). Other PROs under other Ministries are mission-oriented PROs. Their mission varies; some of them are mainly focused on research, some of them have also other duties. [VTT](#)³⁵ is the biggest multi-technological applied research organisation in Northern Europe. VTT's turnover was €251m in 2014, external revenue €163m (65 % of turnover), block funding €88m (35 % of turnover) and revenue from abroad €52m (21 % of turnover). VTT has four subsidiary corporations: VTT Expert Services Ltd, VTT Ventures Ltd, VTT International Ltd and VTT Memsfab Ltd. Turnover of the whole VTT Group was €277m in 2014. VTT's role in driving Finnish participation in EU-programmes is very important, as VTT ranks first in Finland in rising funding from the EU Framework programmes (22 % of all Framework programme funding). According to the European Research Ranking³⁶ VTT is ranked 5th among research and technology organisations, and #10 among all European research organisations (PROs, HEIs, research units of enterprises, funding organisations).

In 2014, there were 363,587 companies in Finland of which 325,057 had less than 4 employees, and 19,116 had more than 10 employees. The number of large companies was 583 of which 119 had more than 1,000 employees. The number of medium sized companies is low ([Statistics Finland, Structural business and financial statement statistics 2014](#))³⁷. A bit more than half of the companies (with more than 10 employees) reported innovation activity in 2010–2012 ([Statistics Finland, Innovation activity 2014](#))³⁸. Private sector R&D expenditure in 2014 was €4.4b, 2.14 % of GDP and 68 % of GERD. The contribution of manufacturing was 71 % and other sectors (mainly services) 29 %.

³³ <http://www.minedu.fi/OPM/Tiedotteet/2016/03/TIN.html?lang=fi>

³⁴ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true

³⁵ http://www.vttresearch.com/Documents/vtt_about_us/presentation_material/vtt_review/vtt_review_2014.pdf

³⁶ <http://www.researchranking.org/?action=ranking%20>

³⁷ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_yri_yrti/?tablelist=true

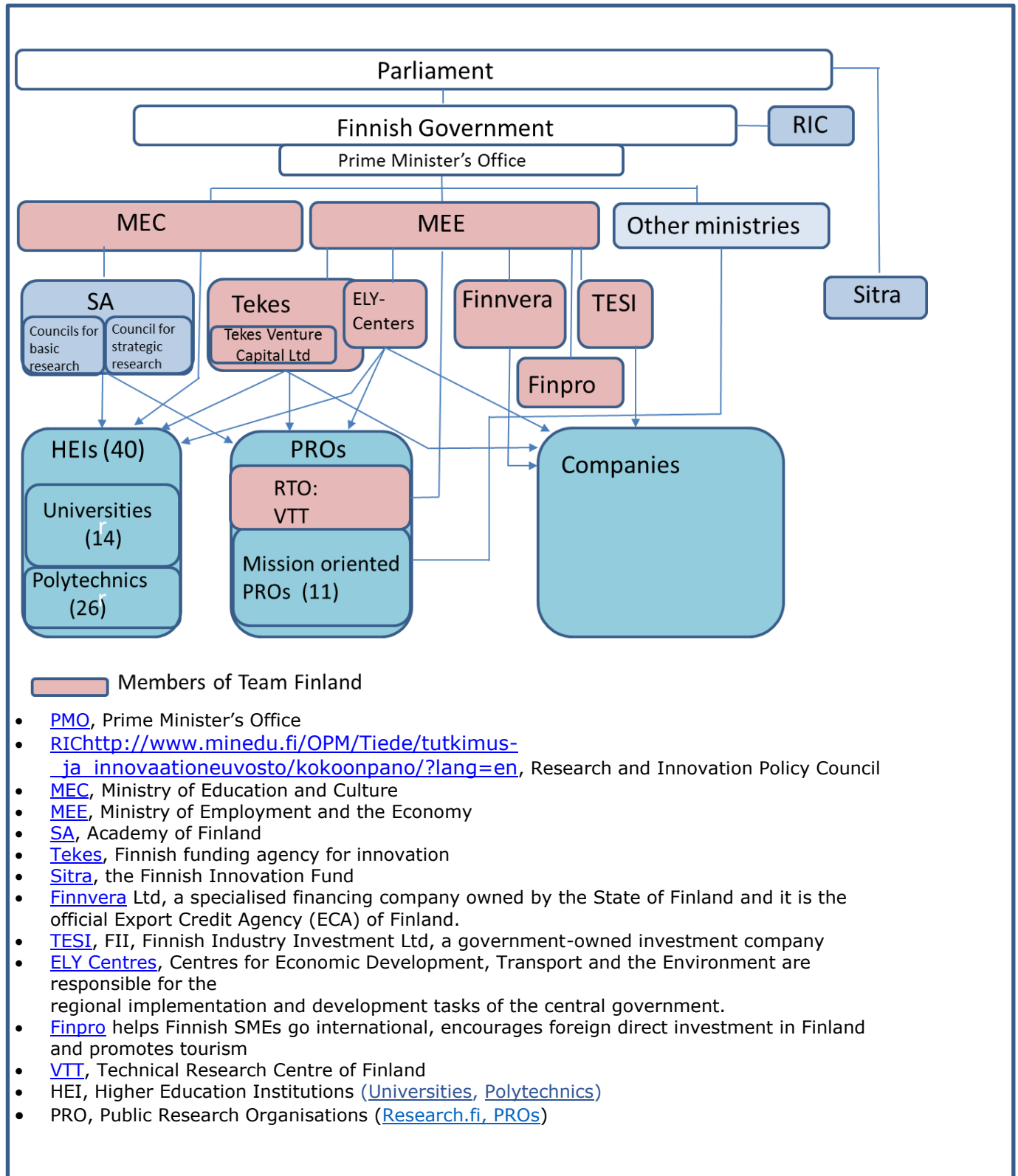
³⁸ http://www.tilastokeskus.fi/til/inn/index_en.html

The share of the ICT sector (as a % of BERD) was 46 %, the metal and machinery sector 11 %, chemical sector 5 %, wood and paper sector 2 % and the other manufacturing sectors 7 %. Segmenting the figure based on the company size, 77 % of the R&D was executed by large companies, 4 % by micro companies and 19 % by other SMEs ([Statistics Finland 2015, Research and development 2014](#))³⁹. Thus, Finland's R&D is dominated by large companies. R&D funded by the business sector in Finland was €4.3b in 2014 which was 66 % of GERD (domestic 79 %, from abroad 21 %). According to the AMNE Database the share of the intramural R&D expenditures of the multinationals' affiliates (as a % of BERD, 2011) was 11 % ([OECD: AMNE Database – Activity of Multinational Enterprises](#)). According to the Statistics Finland the number of foreign affiliates was 4,425 in Finland in 2014 covering about 23 % of the turnover of all companies⁴⁰, and 20 % of the business sector R&D expenditures. This share is quite low compared to other OECD countries.

³⁹ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true

⁴⁰ https://www.tilastokeskus.fi/til/ulkoy/2014/ulkoy_2014_2015-12-18_tie_001_en.html

Figure 1 Overview of the Finnish research and innovation governance



2. Recent Developments in Research and Innovation Policy and systems

2.1 National R&I strategy

The direction of Finnish research and innovation policy is set by the Government Programme and guided by the Research and Innovation Council (RIC). The current government of PM Juha Sipilä, nominated in May 2015, has announced its Strategic Government Programme for the period of 2015–2020, which includes five strategic target areas and under those are 26 Spearhead Projects for implementation. The five strategic objectives of the Programme are:

1. Improving employment and competitiveness;
2. Reforming knowledge and education;
3. Promoting welfare and health;
4. Facilitating the bioeconomy and clean solutions; and
5. Reforming ways of working through digitalisation, experimentation and deregulation.

The government has set specific goals and plans for these and will devise indicators to monitor their attainment. In June 2015, ministerial working groups were assigned to each of them. Many of these Spearhead Projects also include specific research and innovation objectives, with further budget allocations attached to them. The specific R&I contributions of Spearhead Projects have not been estimated.

The Research and Innovation Council (RIC) advises the government and its ministries on strategic issues (such as policy priorities and budget allocations, as well as on the evaluation and development of national innovation system as whole) and coordinates science and innovation policies across ministries, whereas the implementation of these policies is the responsibility of respective thematic ministries.

Ministers, industries, funding agencies and the research community are represented in the Council headed by the Prime Minister. In practice, the Council operates through the work of its two sub-committees (i.e. science policy and innovation policy) and with the help of a network of research coordinators representing each relevant ministry. The network of other relevant stakeholders is present, visible and well connected at the operational level.

According to the government decree, the RIC is appointed for the duration of each government term.⁴¹ The first task of each RIC is to advise the newly appointed government with an updated research and innovation policy review. In September 2015, the new government of PM Sipilä had not yet nominated its RIC members and therefore the Council was not yet operational. Hence, currently the latest and technically still valid RIC review dates back to 2014, to the time when RIC gave its advice and recommendations to the previous government (PM Stubb): [Reformative Finland: Research and Innovation Policy Review 2015–2020](#). The recommendations focus on the *most important development themes that are* the radical renewing of the HEI system; boosting the utilisation and impact of the results of R&I activities; and strengthening new growth sources, intangible assets and entrepreneurship. *Other major themes are:* Extensive improvement of knowledge base, selective support to cutting edge knowledge creation, reform of the public research system and enhancement of horizontal cooperation, and sufficient and focused R&D funding.

⁴¹ [Government Decree on the Research and Innovation Council 1043/2008 \(amendment 1028/2011\)](#)

The recommendations emphasise performance, quality and impacts, interaction and cooperation between different stakeholders, and internationalisation. The recommendations define that "internationalisation must be integrated in all R&D activities and decision making - it is not a separate task ... Finland will be proactive in the EU R&D policy. The target is that funding which will be received from the Horizon 2020 is 50% higher than the funding received from the 7th Framework programme." H2020 is rather well aligned with national themes. government prepares an EU R&D strategy, which finds synergies across EU and national objectives. RIC points out knowledge areas and sectors, which are important for Finnish economy and wellbeing, including: ICT, especially mobile and software knowhow; clean solutions in energy, environment and material efficient technologies (cleantech), bio- and nanotechnologies, health and wellbeing, and arctic knowhow. The RIC recommendation, related to the radical renewing of the HEI system, refers to the need of rising the quality and internationalisation, reducing fragmentation, making strategic choices, focusing, building stronger and fewer units, and developing the HEI and PRO system as an entirety.

Concerning public funding the recommendation states that "real governmental R&D funding grew by 15 % during 2006–2010 but declined by 13 % during 2010–2014. Especially institutional funding for VTT and the funding mandate of Tekes have declined: real governmental R&D investments to build knowledge base and for the renewal of industries have dropped in four years by 35 %. At the same time governmental R&D funding for health care has decreased by 20 % and the funding for research in university hospitals has declined by 28 %".

The RIC recommends increasing governmental funding in R&D during 2015–2020 by 2 % yearly in real value. By 2020 this means a €210m increase in real value compared to funding in 2015 level. 65 % of the increase should be allocated through competitive funding (Tekes €85m and the Academy of Finland €50m). Implementation of the recommendations for 2015–2020 starts in 2015 but the changes compared to the previous recommendations from 2010 are not that radical. The RIC recommendations are taken seriously - indeed most of the previous recommendations (in 2010) have already been implemented.

It is noteworthy that the new Sipilä government has introduced major changes to the Finnish research and innovation policy, which also deviate from the line and recommendations made in the RIC 2014 review. This, combined with the continuing decrease of private sector RDI investments, has quickly made the RIC 2014 review budget recommendations somewhat outdated.

In March 2016 (with an effect from April 1st), the Finnish Government approved an amendment to the degree of the Research and Innovation Council (RIC). According to the new amendment, the composition of the council will be reduced (the maximum number of ministers reduced from nine to four) and its tasks will be more strategic and pre-emptive than before. The council will be headed by the Prime Minister, and supported by the key research ministers; the Minister of Education, Science and Culture and Minister of Employment and the Economy. It is noteworthy that the Council Secretariat will cease to exist and the preparatory tasks will be assumed by the ministries, Tekes and the Academy of Finland. It is now anticipated that a new Council will soon be nominated and operational accordingly.⁴²

The major R&I programmes in Finland are thematic and funded by the Academy of Finland, Tekes and by the industry led SHOK consortia. However, as stipulated in the new Government Programme, the SHOK and INKA programmes will be terminated, leaving the Academy and Tekes as the main programme funders. Policies promoting clusters and collaboration platforms will still be continued through other means and by transferring the lessons and practices from SHOK and INKA.

⁴² <http://www.minedu.fi/OPM/Tiedotteet/2016/03/TIN.html?lang=fi>

2.2 R&I policy initiatives

- Due to the severe economic situation in Finland, the PM Sipilä's Strategic Government Programme introduced significant budget cuts to public expenditure from 2016 onwards, with direct impact on the allocations and implementation of the national R&I policy. The proposed reductions in Government R&D budget allocations for 2015–2016 were in total of €157m (-9.4%) and were distributed followingly (Government R&D funding in the state budget)⁴³
- Universities, -0.4 %
- Public research organisations, -24 %
- Academy of Finland, +3.9%
- Tekes, -23 %
- University Hospitals' research, -32 %
- The final R&D budget allocations are subject to change due to continuing negotiations, while the overall direction of significant cuts is evident. The proposed budget cuts imply several changes for Tekes in particular, including:
 - Termination of the SHOK and INKA funding
 - Less focus on large company projects and public research projects
 - Shifting the budget balance from grants to loan instruments

At the same time, several of the 26 proposed government Spearhead Projects (see chapter 2.1) include activities relevant to research and innovation, which are largely in line with the overall R&I policy, but are in many ways more specific. These Projects have separate and significant dedicated budgets for their implementation (altogether €1.6b have been allocated to the Spearhead Projects in the budget proposal), which may show as an increase to the previously anticipated government budget allocations to R&I. However, the details of the government Spearhead Projects are still being planned and specific budget allocations are not available.

The new government is also committed to build and strengthen the cross-governmental Team Finland services for enhanced collaboration and investments supporting the internationalisation and growth of SMEs, with the help of Team Finland Growth Programmes. The total budget for various Growth Programmes is €51.3m for the period of 2015–2017. The key operator of the Growth Programmes is Finpro, while also Tekes and the Ministry for Foreign Affairs of Finland play an important role, among others. Currently there are several programmes running or being prepared and grouped under the following broad topics: ([Growth Programmes](#))

- ✓ Bioeconomy (e.g. saw mills, bioprocessing, biomaterials, agro machinery)
- ✓ Cleantech (e.g. water, electricity and energy, cleantech & bioinvest)
- ✓ ICT and digitalisation (e.g. IoT, Big Data, Digital Africa)
- ✓ Life sciences and health (e.g. Finland care, digital hospitals)
- ✓ Foodstuffs
- ✓ Creative industries and design
- ✓ Teaching and learning
- ✓ Manufacturing and arctic competence
- ✓ Tourism
- ✓ Cross-cutting themes (e.g. emerging markets, business intelligence)

⁴³http://www.tilastokeskus.fi/til/tkker/2016/tkker_2016_2016-02-25_tie_001_en.html

Evaluations, consultations, foresight exercises

Governmental reviews, studies, evaluations and guidelines act as the instruments that guide and inform the science policy makers at the national level. Starting in 2015, the Prime Minister's Office has played an active role in national foresight cooperation. In this, it is tasked with supporting foresight activities and networking. The Prime Minister's Office and Sitra coordinate the national foresight network and support foresight activities and networking in Finland ([Foresight.fi is the website of the National Foresight Network](http://foresight.fi)). The Government Foresight Group appointed by the Prime Minister's Office on 21 January 2015 is responsible for leading and coordinating national foresight efforts and for making this operation visible (PMO; National foresight cooperation)⁴⁴. <http://vnk.fi/en/foresight> Once during each electoral period, the government submits to the Parliament a foresight report on long-term perspectives. The foresight report provides the government's view on the chosen issues and associated policies. In 2013, the government Report on the Future⁴⁵ was issued by the government. The report explores new directions for Finland. For the first time, a separate foresight phase was included in its preparation. This foresight phase was implemented in collaboration between the Prime Minister's Office, Sitra, the Academy of Finland and Tekes, alongside a host of independent specialists and experts from research institutions, enterprises and NGOs. The government Foresight process itself was also evaluated in June 2013, with the intention to further develop the collaborative and open policy foresight approach for future governments (Ennakointihankkeen arviointi, Piirainen & Halme 2013). Based on the recommendations, among others, the Prime Minister's Office published a Proposal for the National Foresight Approach in 2014 ([National Foresight Approach](#)).

In addition, several different types of foresight activities have been carried out for instance by the Parliamentary Committee for the Future, by the ministries, Tekes, the Academy of Finland, research institutes and universities. Foresight studies have often been done in association with research programmes of the Academy of Finland or Tekes programmes. During the last decade the foresight process has been done nationally together. Starting in 2014 the national foresight process integrates strategy work of several organisations: the Academy of Finland, Tekes, Sitra, VTT, Finnvera and Finpro. Many organisations (like Sitra and Tekes) have their own foresight processes related to the preparation of new programmes.

[The Future Watch service](#) of Team Finland produces information and views on the international business opportunities emerging in different countries within a time frame of 2–5 years. This service is coordinated by Tekes, which, in collaboration with the Ministry for Foreign Affairs and Finpro, collects and compiles information from various sources around the world. Information purchased from third parties is also used.

There is a very strong and systematic evaluation culture in Finland, and this is particularly true for the evaluation of government policies supporting research and innovation. Finland was ranked 1st in the World in the terms of evaluation culture by evaluation experts ([Jacob S et al., 2015](#)). Finnish Evaluation Society is a national voluntary organisation of evaluation professionals for the open dialogue on evaluation ([SAYFES](#)).

One of the most influential evaluations for research and innovation policy during recent years was the International Evaluation of Finnish Innovation System in 2009, and partly as a consequence of it all of the main actors, their activities, impacts and funding instruments have been evaluated. (See Annex 3). The evaluation has strongly guided the development of innovation policy in Finland.

⁴⁴ <http://vnk.fi/en/foresight>

⁴⁵ <http://vnk.fi/en/government-report-on-the-future>

It is a tradition that the rationale, performance and effectiveness of all key operators in the Finnish research and innovation system are independently evaluated in certain periods. Further to the evaluation of the whole innovation system, a number of institutional evaluations were launched, resulting eventually in further structural changes. The evaluations include, inter alia, the evaluation of VTT (2010), the evaluation of Tekes (2012), the evaluation of Finnvera (2012), the evaluation of the Academy of Finland (2013), the evaluation of the Strategic Centers for Science, Technology and Innovation, SHOKs (2013), the evaluation of FII (2013), the evaluation of OSKE (2013) and finally the evaluation of the RIC (2014). (For a full list, see Annex 3)

To follow through the implementation of recommendations made by these evaluations, the MEE commissioned in 2013 [a Study on the Impacts of the Evaluations Made in 2009-2014](#) (in Finnish). In these evaluations a total of 157 recommendations were made. According to the study, 80 % of the recommendations went to operational execution phase (42 % completed, 41 % in progress), 7 % were deemed irrelevant, and 10 % were not put into practice. It seems that the culture of evaluations supporting evidence-based decision-making is working well.

The international evaluation of the activities of the Research and Innovation Council was published in March 2014. Based on the evaluation, the intention is to revamp the Council's activities during 2015, while no specific progress or plans to that end have been reported yet.⁴⁶

The funding agencies Academy of Finland and Tekes have a long history in conducting evaluations of their own funded activities. The Academy of Finland evaluates the state of science in Finland every second year. The state of scientific research in Finland 2014⁴⁷ reviews the overall state and the position of the Finnish research system, comparing it internationally. In the report the relative strengths of different scientific disciplines are discussed and areas in the need of further development identified. In a similar manner, Tekes evaluates all of its programmes and instruments (including mid-term and ex-post evaluations) and has integrated impact assessment into yearly strategy and management process (Saarnivaara V-P, Uusikylä P, 2014, Impact Evaluation - Finnish Experience)⁴⁸. List of programme evaluations is included in Annex 3.

Considering the bigger picture of evaluations, there is no reliable macroeconomic model to measure the impact of R&I on economic growth. Such modelling is difficult due to the challenges in measuring indirect and spill-over effects, taking into account time delays, and in defining valid reference groups in counter-factual analyses. The same challenges are related to many evaluations made in Finland. Tekes has an impact (logical framework) model but it is a simplification of the complex path dependencies, and MEE launched in December 2015 a new impact model (logical framework) for business and innovation policy. It is based on the strategic targets and operational objectives of the government programme, and includes metrics and indicators for them.⁴⁹

2.3 European Semester 2014 and 2015

In February 2015, the Commission published a series of country reports, analysing Member States' economic policies and in May published country-specific recommendations⁵⁰ for each Member State. According to the report, Finland is experiencing macroeconomic imbalances, which require policy action and monitoring. In particular, risks related to weak export performance in a context of industrial restructuring deserve attention.

⁴⁶ National Reform Programme, 2015

⁴⁷ <http://www.aka.fi/en/research-and-science-policy/SOSR/>

⁴⁸ <http://www.vpsolutio.fi/SiteAssets/referenssej%C3%A4/Impact%20Evaluation%20-%20Finnish%20Experience.pdf>

⁴⁹ Elinkeino- ja innovaatiopolitiikan vaikuttavuusmalli ja mittarit. Loppuraportti 3.12.2015. (Impact model and indicators for business and innovation policy, in Finnish). Tempoeconomics.

⁵⁰ COM(2015) 250 final: 2015 European Semester: Country-specific recommendations.

While the decline in export market shares and manufacturing industries has largely come to an end investment remains low and potential growth has declined. Private-sector debt has stabilised and does not appear to be a source of immediate concern, but its relatively high-level calls for close monitoring.

The key findings of Finland's economy were:

- Following a steady deterioration from 2003 until 2011, the Finnish current account has
- stabilised at a small deficit.
- The rapid decline of some manufacturing industries (electronics and forest) has largely ended.
- The productivity of Finnish companies is in line with its Nordic peers and recently the growth in labour productivity started to accelerate.
- While public investment is relatively high, private investment is low.
- Private-sector debt does not appear to be a source of immediate concern, but it needs to be closely monitored.
- Finland's debt-to-GDP ratio is on a rising trend and will exceed 60 % in 2015.
- Recent labour market performance has been weak, but still compares favourably with the EU-average.
- The Finnish retail sector remains highly concentrated, being dominated by two local retail groups.

Finland does not, however, yet comply with the debt and the deficit criterion of the Stability and Growth Pact. The Economic and Financial Committee will therefore provide its opinion on the report after which a decision on whether to open the excessive deficit procedure is to follow.

According to the European Commission, Finland has made progress in addressing its 2014 country-specific recommendations. An important development is the agreement reached between the social partners regarding implementation of the pension reform from 2017. In addition, reforms of the social and healthcare sectors have been initiated to better control expenditure growth in these areas. Some steps to increase the growth-friendliness of the tax system have been taken. The government also took new measures to diversify the economy, notably through the promotion of innovation and investment in digitalisation, biotechnology and clean technologies. Furthermore, public support focuses on promoting exports of SMEs and on risk capital.

One of the EU Recommendations in the 2014 Report was particularly focusing on innovation, hence suggesting: "Continue to boost Finland's capacity to deliver innovative products, services and high-growth companies in a rapidly changing environment, and continue the diversification of industry, in particular by improving the business environment to strengthen investment in Finland and further facilitating smaller firms' entry into export markets..." The Finnish government's reported actions^{51 52} to this end, include, inter alia:

- For 2013-2014, the Finnish government introduced a fixed-term R&D tax incentive for companies. During its first year, over 600 companies used this benefit and received an average EUR 125,000 tax deduction. The government also decided on a fixed-term tax credit in 2013-2015 for private individuals to invest in start-up companies. However, during the first half year, utilisation of this incentive fell short of expectations.

⁵¹ National Reform Programme, Finland, 2015.

⁵² Europe 2020 Strategy - Finland's National Programme, Spring 2015, Ministry of Finance, 12c/2015

- The government has shifted the focus from direct grants to refundable forms of funding, such as loans, guarantees and equity investments. An increasing amount of innovation support is targeted at SMEs. The government's objective has been to use business aid to restructure the economy and industry and to boost the internationalisation of companies.
- In 2014 the government increased the funding of universities, the Academy of Finland and TEKES by 4 %. R&D appropriations and authorisations for 2015 rose in the central government budget to €2b. The amount of R&D funding grew by nearly €50m from the previous year. Public research funding as a proportion of GDP is estimated to be 0.96 %
- €330m allocated to a fund programme in 2014-2017 in order to promote growth of private equity financing. €100m of this sum will be used to restructure the manufacturing industry in the target areas bioeconomy, cleantech, health and digitalisation. In addition, Tekes Venture Capital Ltd was founded to make investments totalling €20m per year in companies and in funds focusing on start-ups.
- Finnish Industry Investment Ltd launched, in cooperation with pension insurance companies, the FoF Growth II Fund with a total investment capital of €130m. This is expected to catalyse a total of around one billion euros of investment at the portfolio company level.
- Policy measures to increase the productivity of industry and services included the acceleration of industrial restructuring (e.g. ICT 2015 programme, cleantech, bioeconomy). Efforts towards this goal were made a) by raising the potential of ICT to increase productivity, b) by creating efficient e-services that facilitate the development and internationalisation of Finnish companies, c) by developing service sector productivity, e.g. with the aid of Tekes programmes.
- The Team Finland network was established by bringing together services from the Ministry of Employment and the Economy, the Ministry for Foreign Affairs, the Ministry of Education and Culture, and publicly-funded organisations and international operating locations subordinate to these ministries (including Finland's foreign missions, Finpro and Tekes operating locations, and culture and science institutions). The establishment of Team Finland has streamlined business internationalisation services and increased the joint initiatives and cooperation of the key Finnish parties of the innovation system. Around €50m was allocated in The Team Finland growth programme during the three years to promote tourism, internationalisation of companies and foreign investment.

The EU's 2015 Country Specific Recommendations⁵³ for Finland did not include specific measures for boosting research and innovation anymore. The recommendations included: to achieve a fiscal adjustment of at least 0.1 % of GDP towards the medium-term budgetary objective in 2015 and of 0.5 % of GDP in 2016; to continue efforts to reduce the fiscal sustainability gap and strengthen conditions for growth; adopt the agreed pension reform and pursue efforts to improve the employability of young people, older workers and the long-term unemployed, focusing particularly on developing job-relevant skills. Promote wage developments in line with productivity fully respecting the role of the social partners and in accordance with national practices.

The previous (2014) European Semester already reported numerous changes in the Finnish research and innovation system, which, to a large extent, are still being implemented in 2014-2015. One of those was the Finnish government's decision on the principles of the comprehensive reform of central government research institutes and research funding in 2013.

⁵³ Macroeconomic Imbalances, Country Report – Finland 2015. European Commission, European Economy, Occasional Papers 225, June 2015, and Council Recommendation of 14 July 2015 on the 2015 National Reform Programme of Finland (2015/C272/04)

The objective of the reform was to strengthen multidisciplinary, high-level and socially significant research, release resources from research support services and fixed structures into research activity and, by field of research, to organise research institutes into larger and stronger entities. According to the government, the key measures of the reform have advanced according to plan, including the merger of certain research institutes, the turning of the VTT Technical Research Centre of Finland into a wholly state-owned company, and the establishment of a new Strategic Research Council in connection with the Academy of Finland. Cooperation between research institutes and universities will be increased in accordance with a roadmap prepared in 2015.

The government has initiated major structural and instrument specific changes to address the challenges facing the Finnish economy. The Finnish National Reform Programme (NRP) is based on the Europe 2020 Strategy (Ministry of Finance 2012). The programme has recently been updated ([Europe 2020 Strategy, Finland's National Programme, Spring 2015](#)). It defines that Finland's national targets are raising the employment rate of the population aged 20–64 to 78 %, maintaining R&D expenditure at a minimum of 4 % of GDP, reaching the climate and energy targets agreed in the EU, keeping the proportion of people aged 30–34 having completed tertiary-level education at 42 %, decreasing the proportion of 18–24 year-old early school leavers below 8 %, and reducing the number of people living at the risk of poverty and social exclusion.

Even though both Finnish public and private investments in research, development and innovation continue to be high in international comparison, in absolute and relative terms (e.g. relative to GDP) they are steeply declining, and a critical issue of innovation efficiency remains. That is, how research is translated into innovations and new high-growth companies, and how the growth companies can penetrate fast growing export markets and strengthen international competitiveness. In the short term, Finland should increase its cost competitiveness, and in the long term, implement the new RIC recommendations, and propose further reforms, where relevant, based upon existing evaluations and foresight work.

The [ICT 2015 working group](#) was appointed already in 2012 to prepare a strategy to mitigate the effects of the sudden structural change in the ICT sector as well as to reform the information and communications technology sector and to increase its competitiveness. The strategy proposed by the working group is not an official governmental strategy but its implementation is followed by the government. The strategy is still valid and serves as an important basis for development.

The government approved the decrees related to [the revision of the university funding model](#) (MEC, 2014). government appropriations will be directed especially on the basis of performance and quality. The new Universities Act (558/2009) and the use of the new funding model came into effect in 2013. Further development of the funding model is focused on measuring societal and economic impacts of universities and is intended to take force in 2017. The basic structure and emphases of the funding models will remain as before, but necessary adjustments will be made to criteria describing effectiveness, quality and internationality.

[The reform of Finnish Universities of applied sciences](#) (MEC 2014) was initiated as a part of the government Programme in 2011. The new Polytechnics Act came into effect in the beginning of 2014. The responsibility for polytechnic funding as a whole was transferred to the government, and polytechnics were made independent legal entities. The license to provide polytechnic education was revised, with new emphasis on quality and impact. The new funding model allocates 85 % of resources to education and 15 % to R&D. About 70% of funding is allocated based on the number of examines awarded, and 30 % based on performance indicators related to the quality, internationalisation, regional impacts and cooperation with working life.

The Council for Strategic Research and the Finnish Committee for Research Infrastructures (FIRI Committee) was established in 2014 and are operating under the Academy of Finland. A new [Finland's strategy and roadmap for research infrastructures 2014–2020](#) was also released (MEC, 2014). (See Chapter 4.2.1)

A regional innovation programme called Innovative Cities (INKA) was launched in 2014, replacing the previous National Centre of Expertise Programme and its Clusters (OSKE). However, already the next year (2015) the government of PM Sipilä decided to run down the INKA Programme as part of the overall budget cuts (see Chapter 2.1). [Team Finland](#) strategy was updated in 2014 (Prime Minister's Office 2014). The MEE reorganised Finpro in 2014. [Tekes Venture Capital](#) Ltd was established in July 2014. Activities under Tekes Venture Capital were in effect moved from Finnvera to Tekes.

The mandate of Finnvera ([Finnvera news 2015](#), in Finnish) was also enlarged. As a result, Finnvera can increase risk in its funding. The new mandate improves funding especially for start-ups and growth companies entering international markets and medium or large companies which have turnover up to €300m. Export guarantees are now available at domestic markets, too.

2.4 National and Regional Research and Innovation Strategies on Smart Specialisation

Finland is committed to the Europe 2020 strategy and its objectives and in order to reach these goals (smart, sustainable and inclusive growth), every region should formulate a Research and Innovation Strategy for Smart Specialisation (RIS3). This is a continuous process with the goal of strengthening the region's economy. In Finland, the RIS3 strategies of individual regions are set and overseen by the Regional Councils.

The principles of Smart Specialisation have traditionally been applied in Finland both on national and regional level, and a process is going on to further strengthen the specialisation. For multi-scientific, cross-technological, knowledge-integrated, problem-oriented research in a small economy, intensified cooperation between the actors is required. Although the need for specialisation is obvious, the processes to implement it have to combine both top-down and bottom-up approaches in order to avoid the risks involved in making poor choices in top-down policy. Smart specialisation in Finland is especially focused on the creating of knowledge base, lead markets initiatives and ecosystems development. Public funding for business R&I has to be flexible allowing risks in order to pursue good business ideas. This should not depend on the predominant field of strategic agendas.

The goal in the big picture in the Finnish research policy is to increase specialisation of universities and PROs, which means doing stronger strategic choices. The UNIFI ([Universities Finland](#)) is negotiating to agree priorities and focus areas among universities and the MEC and the Academy of Finland (€50m) support the process - by funding incentives, too. The already discussed reform of research institutes and research funding aims at creating the critical mass, reducing fragmentation, building knowledge hubs, and strengthening evidence based policy. Smart specialisation is also supported by competitive funding: about 60 % of Tekes funding and about 30 % of the Academy of Finland funding are focused on strategic choices. Under the RIS3 guidelines and frameworks, each region has its own way of designing, organising and implementing its RIS3 strategies. For example, in the Capital Region (Uusimaa), RIS3 strategy is implemented in the form of five main priorities and related priority portfolios, and their activities are organised on shared, thematic innovation platforms. The platforms are used to coordinate the progress and change processes as well as to promote active collaboration between and within the key actors and their stakeholder. It is also typical that the smart specialisation strategies are tightly coupled with other regional plans, regional strategic programmes and other plans of the provinces. Innovation is a common topic to all regions in Finland and the RIS3 objectives are not difficult to align with other regional objectives.

The current period of the EU Structural Funds (SF) 2014-2020 includes a range of innovative actions through smart specialisation. The activities included in the S3 strategies and funded under the Structural Funds, are typically complemented with other nationally and regionally funded innovation activities. Amongst the national level activities targeted towards the regions, the Innovative Cities (INKA) Programme formed one part. However, INKA is due to be terminated at the end of 2015, and the Growth Agreements was temporary. Although the government is planning to negotiate new Growth Agreements with the major cities.

To intensify cooperation and to ensure knowledge building on regions, the regional actors together with the national government and HEIs have jointly contributed to the establishment of six regional university centres in several non-university towns. The university centres gather the operations of several universities in one location in these towns. Cooperation between universities, polytechnics and research institutes is aimed to build stronger but fewer regional knowledge hubs to boost European SF interventions in RDI.

[The Regional Innovation Scoreboard 2014](#) covers five regions in Finland: Itä-Suomi (FI13), Etelä-Suomi (FI18), Länsi-Suomi (FI19), Pohjois-Suomi (FI1A) and Åland (FI2). According to the scoreboard, Finland belongs to the performance group innovation leaders, with 3 regions (FI18, FI19, FI1A) being among the leaders and 2 (FI13, FI2) being among the followers. Åland (FI2) is quite a special case because it has a strong independent status in Finland. The state of Finland is not allowed by law to get involved in Åland's policy (such as public R&D funding). According to [RIS 2014](#) innovation growth performance is 2.5-15 % in Pohjois-Suomi (FI1A) and 0-2.5 % in other regions. According to the EU Funding typology, Etelä-Suomi (FI18) is the only FP leading absorber, whereas Itä-Suomi (FI13) and Pohjois-Suomi (FI1A) are SF leading users and Länsi-Suomi (FI19) SF low user. In early 2014, thirteen regions took part in the S3 Platform of the European Commission.

2.5 Main policy changes in the last five years

Main Changes in 2011

The polytechnic reform (a government programme)

Main Changes in 2012

The reform of research institutes and research funding (a Committee recommendation)

New openings of Tekes programmes (continuing yearly)

Capitalisation of the Finnish Industrial Investment (2012, 2014-2017)

Main Changes in 2013

The new university funding model

Open public data initiative (continuing yearly)

European Regional Development Fund and European Social Fund measures combined and prepared for the programme period 2014–2020, launching the INKA programme,

Growth agreements with 12 cities

The R&D tax incentive for labour costs

Tax incentive for business angels

Streamlining public services for companies

Main Changes in 2014

Research and Innovation Policy recommendation (RIC) 2015 - 2020

The polytechnic reform (the new Polytechnic Act took force)

The reform of research institutes and research funding implemented 2014-2017, including: Council of strategic research, Merging of PROs, Change of VTT's legal status (starting 2015)

The R&D tax incentive for labour costs was terminated

Capital investments in universities continued (with one private € three public €)

Open science and research roadmap 2014-2017

Strategy and Roadmap for Research Infrastructure 2014-2020

Updated strategy for Team Finland

Enlargement of the Finnvera mandate

Establishment of Tekes Venture Capital Ltd

Reorganizing Finpro (privatizing the export consultancy and market entry unit)

Launching the Smart Procurement programme and INKA Innovative cities programme

Main Changes in 2015

New (PM Sipilä) government, its Strategic Programme and 26 Spearhead Projects

Continuing revisions of the research system

Launch of the Council for Strategic Research operations

Continuing revisions in the university funding models

Decisions to further cut government expenditure on RDI, particularly Tekes funding

Decision to terminate INKA programme and special funding for SHOK programmes

Further development of Team Finland activities (e.g. BEAM Programme)

3. Public and private funding of R&I and expenditure

3.1 Introduction

The Europe 2020 target for Finland is to reach 4 % expenditure to R&D as a proportion of GDP by 2020. However, GERD declined between 2009 and 2013 from 3.75 % to 3.32 % of GDP and is estimated to drop further to 3.13 % in 2014. There are no specific targets for BERD/GERD or BERD/GDP but an overall target is to keep the share of private funding on a high level. The private sector share of GERD decreased from 70 % to 69 % and BERD/GDP decreased from 2.56 % to 2.28 % during 2011-2013 (Eurostat, 2014). The share of the governmental funding increased from 27 % to 29 % of GERD, respectively. The share of funding from abroad increased from 9 % to 12 % of GERD.

The total appropriations and outlays for research and development will increase to €2b in the government Budget in 2015. According to Statistics Finland, R&D funding will increase by close on €50m from the previous year. The share of public research funding in GDP is estimated to be 0.96 %. The growth is based on increased outlays of the Academy of Finland and a new financial instrument for strategic research. From this GBAORD (€2b) 54 % is allocated through the MEC, and 31 % through the MEE. The public funding of private sector R&D is about 3 %, which is very low compared to the 8 % OECD country average^{54 55}.

R&D expenditures of the universities are still quite high (0.73 % of GDP in 2014) (Statistics Finland, 2015, Research and development 2014⁵⁶ and Statistics Finland, Annual national accounts, 2015⁵⁷) but because of the dispersed university structure the use of resources is not as effective as it could be (RIC, 2014)⁵⁸. The government has decided to cut funding for education and research. It seems that the government is looking for effectiveness and quality of public research in universities and research institutes, changing the focus more from cooperative applied research to basic research, and in innovation funding from knowledge building to short term commercialising of research results in innovation. The cuts are a part of fiscal consolidation aimed at reducing government deficits. Another target was that the subsidies for businesses should be decreased. According to the MEE, the subsidies for businesses are more than €4.5b, of which a great deal are harmful and almost the only beneficial subsidies were those for innovation (Renewing the business subsidy system, in Finnish).⁵⁹ Still these subsidies were cut.

The total EU funding that Finland received in the 7th Framework programme 2007 – 2013 (FP7) was €883m, meaning an average of €126m per year (EC statistics). The structural funds (SF) programme 2014–2020 of Finland will distribute a total of €1,299m ERDF €733m and ESF €536m. The share allocated under RTDI priorities will be 41 % of ERDF funds, meaning an indicative yearly funding of €76m. According to the Statistics Finland EU funding in 2013 was €185m.

⁵⁴ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true

⁵⁵ http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/oecd-science-technology-and-industry-outlook-2014_sti_outlook-2014-en#page70

⁵⁶ https://www.tilastokeskus.fi/til/tkke/index_en.html

⁵⁷ https://www.tilastokeskus.fi/til/tkker/index_en.html

⁵⁸ http://www.minedu.fi/export/sites/default/OPM/Tiede/tutkimus-ja_innovaationeuvosto/julkaisut/liitteet/Review2015_2020.pdf

⁵⁹ https://www.tem.fi/files/42746/Yritystukijarjestelman_uudistaminen_vhteenaveto.pdf

Table 2 Basic indicators for R&D investments (Eurostat).

Indicator	2011	2012	2013	2014	2015*	EU (2014)**
GERD (as % of GDP)	3.64	3.42	3.31	3.17	3.1 ⁶⁰	2.03
GERD (Euro per capita)	1332.7	1264.9	1231.7	1194.6		558.4
GBAORD (€m)	2071.7	2064.2	2017.9	1955.6	2002.5 ^{E1}	92828,145
R&D funded by BES (% of GDP)	2.44	2.16	2.01 (2.25) ^{E2}	1.7 (2.08) ^{E2}		1.12 (2013)
R&D funded by PNP (% of GDP)	0.05	0.04	0.04	0.05		0.03 (2013)
R&D funded from abroad (% of GDP)	0.24	0.3	0.38	0.55		0.2 (2013)
R&D performed by HEIs (% of GERD)	20	22	22	23		23
R&D performed by government sector (% of GERD)	9.6	9.7	9.6	9.4		12
R&D performed by business sector (% of GERD)	70	69	69	68		64

^{E1} Government R&D funding in the state budget 2015

^{E2}The Eurostat figures include only domestic R&D funding by the private sector. The figure in brackets include also private R&D funding from abroad

3.2 Smart fiscal consolidation

3.2.1 Economic growth, fiscal context⁶¹ and public R&D

Finland was moderately hit by the 2008-09 economic crisis although the 2009 drop of real GDP (8.3%) is quite high. A weak global economy and loss of external demand for electronic and paper products resulted in significantly lower exports causing durable losses in output and in cost competitiveness due to wage rigidities. Changing economic conditions led to the emergence of a negative output gap, increase in unemployment, an evaporation of current account surplus, and deteriorating public finances. The Finnish economy went through a recession between 2012 and 2014. In 2015 the output remained at its 2014 level and is expected to grow at a very slow pace (0.5-0.9%) in 2016-17 as a result of some increase in the investment, stabilisation of external demand, signs of recovery in the paper and electronics industry and supportive credit conditions.

⁶⁰ http://www.tilastokeskus.fi/til/tkke/2014/tkke_2014_2015-10-29_tie_001_en.html

⁶¹ Sources: DG ECFIN, http://ec.europa.eu/europe2020/pdf/csr2016/cr2016_finland_en.pdf

Before the crisis Finland had protracted budgetary surpluses and low levels of public debt (Figure 2). Together with the changes provoked by the crisis, public finances deteriorated both nominally and in structural terms. government budget has shown deficits since 2009 driven by increasing expenditures along with stagnating revenues. In spite of consolidation efforts, the headline deficit was over the 3% reference value in both 2014 (3.3%) and 2015 (3.2%). In 2016-17 the Commission expects the deficit to fall to 2.8% and 2.5% respectively. As a result of the financial crisis and subdued economic the debt/GDP ratio went up from the 2008 level of 32.7% to the nowadays values of around 60% (2015: 62.7%). the ratio may still grow to 65% (2016) and 66.2% (in 2017). Finland does not seem to face immediate debt sustainability challenges. However, long-term sustainability is a serious concern due to an ageing population. Savings and efficiency increases on the expenditure side are needed. For 2016-2019 the Finnish government announced a public finances consolidation program in order to contain the debt that is expected to stabilise by 2019-20.

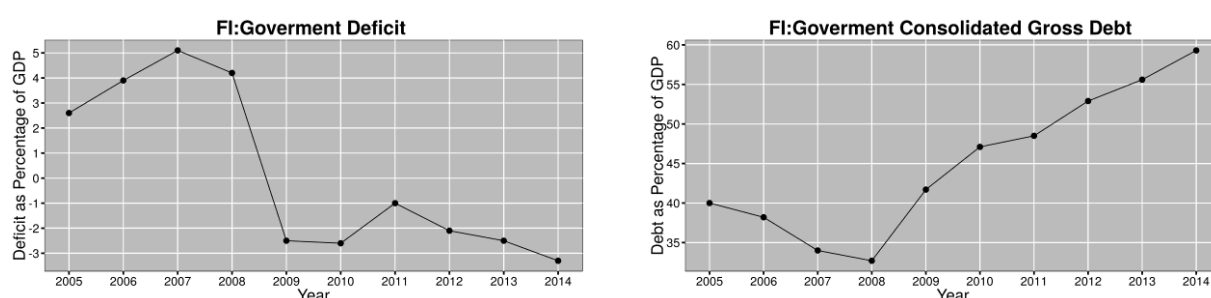


Figure 2 Government deficit and public debt
Data source: Eurostat

Total GERD in Finland was 6,684 million EUR in 2013. There are three main sources of R&D funding: the business sector (4,067 MEUR), the government (1,740 MEUR), and foreign funding (771 MEUR⁶²). Direct funding from the government goes to start-ups and SMEs or big companies in business enterprises (128 MEUR), the government (443 MEUR) and the higher education sector (1,150 MEUR).

Table 3 Key Finnish Public R&D Indicators

	2007	2009	2013
GBAORD, % of gov. exp.	1.96	1.91	1.69
GERD, % of GDP	3.35	3.75	3.30
out of which GERD to public, % of GDP	0.90	1.05	1.00
Funding from GOV to, % of GDP			
Business	0.08	0.07	0.06
Public (GOV+HES)	0.71	0.82	0.79
Total	0.80	0.90	0.86
EU funding, % of GDP	0.07	0.08	0.09

Source: Eurostat

⁶² In 2012 EU funding was 183 MEUR out of total amount of foreign funding of 602 MEUR.

3.2.2 Direct funding of R&D activities

The sources of R&D funding according to the Frascati manual are: Government sector (GOV), Higher education sector (HES), Private non-profit sector (PNP) and Abroad (including EC). In this analysis the public sector as source of funds is given by the Government sector (GOV), whereas the public sector as a sector of performance is the aggregation of GOV and Higher education sector (HES). Figure 3, below shows the historical evolution of GERD financing in current prices in Finland.

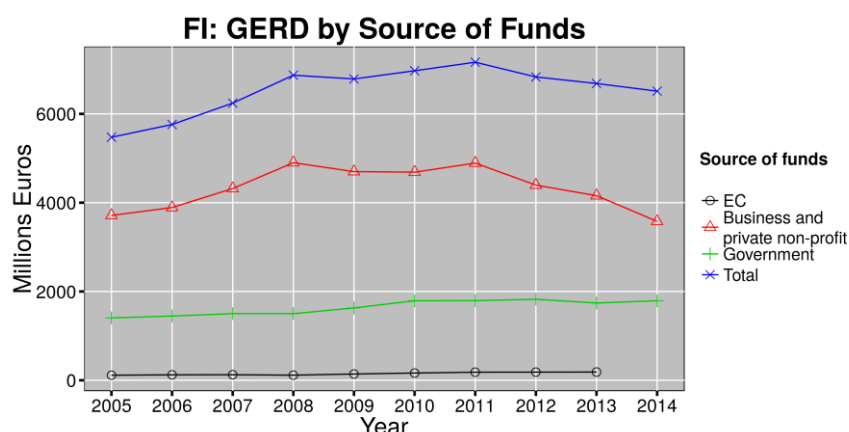


Figure 3 Funding of the total GERD

Data source: Eurostat

The Finish total R&D intramural expenditure (GERD) was monotonously growing until 2008. At the beginning of the crisis, in 2009 total GERD temporary dropped but it recovered completely and even increased by 2011.

From 2012 GERD is decreasing due to the decline of the private R&D which is the most important source of funding for the Finish GERD.

Starting in 2009 the public R&D expenditure increased⁶³ and it was its contribution that helped the recovery of the GERD the first years after the crisis.

3.2.2.1 Direct public funding from the government

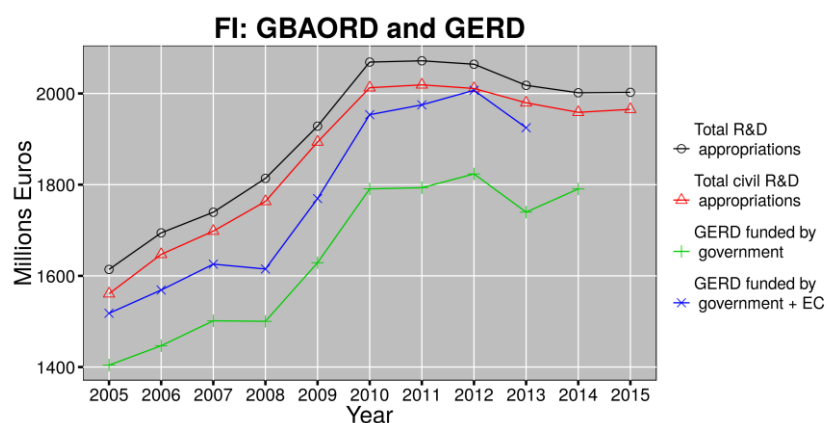


Figure 4 R&D appropriations and government funded GERD in millions of national currency

Data source: Eurostat

⁶³ Fluctuations in the behaviour of the GERD funded by the government are not visible due to the scale

Figure 4 shows a continuous increase in the total (civil) appropriations from 2005 to 2010, followed by two years of stagnation and a mild decline in the post-crisis period, 2013-2014. In 2015 there was no significant change in the total GBAORD. Given that the total government expenditure increases every year during the period 2005-2013, stagnation and drop in the GBAORD from 2010 to 2015 signifies cuts in the budget for R&D. Significant cuts have been agreed for 2016-2019 under the Government Programme.

The difference between the total and the civil appropriations remains approximately constant.

GERD funded by the government follows a very similar pattern when measured in absolute volumes, although it is significantly lower than the budgeted R&D investments. As demonstrated in the next section, the contribution from the European Commission through Framework Programmes and Structural Funds increased in the period 2010-2013, possibly due to the lifecycle of the latter.

3.2.2.2 Direct public funding from abroad

Table 4 Public Funding from Abroad to the Finnish R&D (in millions of national currency)

Source from abroad	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total	343.78	408.72	406.75	456.05	448.33	479.24	468.73	601.68	771.40	1128.10
BES	211.62	263.91	256.03	319.80	285.18	288.81	262.18	387.69	553.90	
EC	113.68	122.21	124.23	114.77	140.68	162.69	181.81	183.41	185.10	
International Organizations					9.08	4.76	5.99	4.05	5.00	
Total as % GERD	6.28	7.09	6.52	6.64	6.61	6.87	6.54	8.81	11.54	17.32
EC as % GOVERD	8.1	8.45	8.27	7.65	8.64	9.08	10.14	10.06	10.64	

Funding from abroad tripled between 2005 and 2014, accounting in 2014 for 17.3% of total R&D investments. Most of the funding comes from the business sector but the contribution from the European Commission (both structural funds and framework programmes for research) also increased over the years and in 2013 represented over 10.5% of the GERD funded by the government (public direct support). As shown in figure 4, EC funding compensated in a way for the losses in the public R&D between 2010 and 2013.

Based on data from DG REGIO, the allocation to core⁶⁴ RTDI structural funds is 9.8% of the total structural funds that Finland received for 2000-2006 and 18.4% of total structural funds in the period 2007-2013, i.e. an increase in the allocated funds of about 88%. Moreover, in Finland the share of Structural Funds for Core R&D is much higher (almost double) than the corresponding share at EU28 level (Finland 18.4%; EU28 9.4%).

⁶⁴ Core R&D activities: 01 R&TD activities in research centres; 02 R&TD infrastructure and centres of competence in a specific technology; 03 Technology transfer and improvement of cooperation networks; 04 Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres); 74 Developing human potential in the field of research and innovation, in particular through post-graduate studies.

Figure 5, below shows how the distribution of public funding to sectors of performance evolved over time:

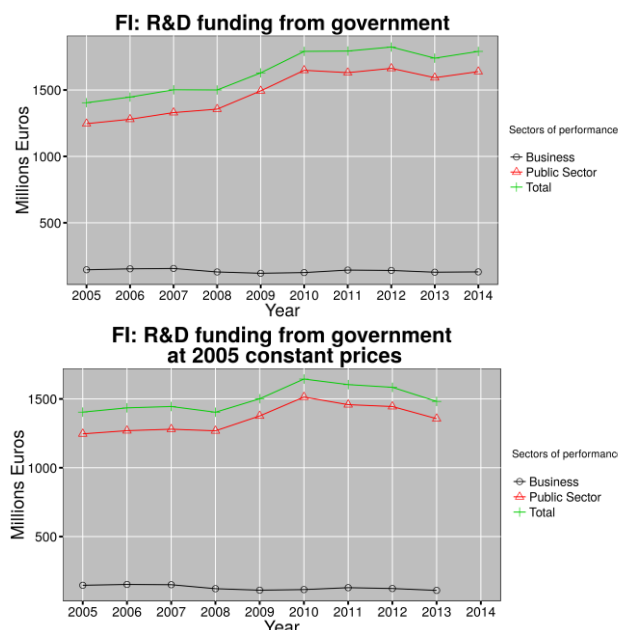


Figure 5 Government intramural expenditure by sectors of performance

Data source: Eurostat

Not surprisingly, the public sector (GOV + HES) is the main recipient of government funded GERD but it is not the only one affected by the cuts from 2011 onwards. The private sector has marginally been affected too, especially in 2008 and 2013. According to the OECD, in 2012 the total government support to business R&D in Finland is 0.07 % of GDP

3.2.3 Indirect funding – tax incentives and foregone tax revenues

In Finland public R&D support to companies consists almost fully of direct subsidies. R&D tax incentive schemes did not come into force until 2013. The objective of the Corporate Research and Development (R&D) Tax Relief in 2013-2015 is to increase R&D activity in companies and to create new high added-value jobs; limited-liability companies and cooperatives are granted supplementary 100-per cent tax relief on any salary expenses for R&D activity related to their own business operations.⁶⁵ A second tax subsidy scheme offers accelerated depreciation related to R&D construction investment, but the tax benefit has been small.⁶⁶

3.2.4 Fiscal consolidation and R&D

Figure 6, below shows the scatterplot of the structural balance and GBAORD as % GDP, (first panel) as well as GERD as % GDP, (second panel).⁶⁷

⁶⁵ 2013, OECD 'Measuring R&D Incentives' http://www.oecd.org/sti/2013OECD-NESI%20RDTaxIncentiveSummaryDescription_03Apr2014.pdf

⁶⁶ 2014, study for TAXUD: 'A Study on R&D Tax Incentives - Annex: Country fiches

⁶⁷ Structural balance data comes from the AMECO database the other indicators were taken from Eurostat.

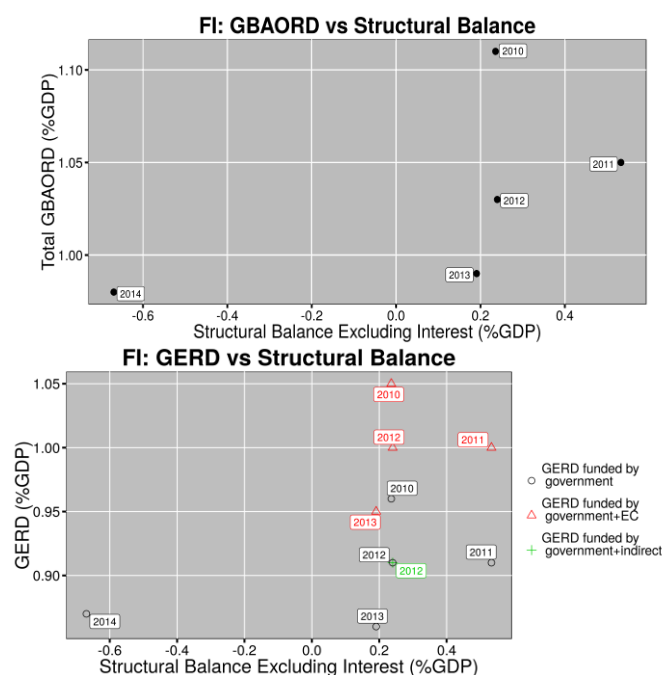


Figure 6 Fiscal consolidation and R&D

Data source: AMECO, Eurostat

It is evident that between 2010 and 2014 both R&D appropriations (GBAORD) and government funded GERD decreased as a share of GDP⁶⁸. During the same period the structural balance fluctuated slightly in the positive side (between 0.2 and 0.6% of GDP), apart from 2014 when for the first time became negative (Figure 6). There is no indication of fiscal consolidation. It seems, that the attempts of the government to preserve and improve the structural balance came at the expense of the R&D expenditure. Based on the analysis and the discussion provided in this report, we can argue that the post-crisis fiscal adjustment has come at the expense of public support for R&D in Finland.

3.3 Funding flows

3.3.1 Research funders

The Ministry of Education and Culture (MEC) and the Ministry of Employment and the Economy (MEE) play the main role in public research funding (85% of GBAORD). MEC allocates the main part of its funding directly and through the Academy of Finland to HEIs and PROs. MEE's R&D funding is mainly allocated through Tekes. Other ministries' share of the funding is 15% (Ministry of Agriculture and Forestry 5%, and Ministry of Social Affairs and Health 4%).

In 2014, public R&D funding amounted €1,899 million, private non-profit funding €93m, and funding from abroad €1128m including EU funding €178m. MEC's institutional funding for universities (90 % of HEI institutional funding) is allocated on the new performance and quality based funding model of universities (MEC 2014; Universities Core Funding⁶⁹).

⁶⁸ As we have seen on Figure 3, both R&D appropriations (GBAORD) and government funded GERD have stagnated or slightly decreased also nominally during 2010-2013.

⁶⁹

http://www.minedu.fi/export/sites/default/OPM/Koulutus/yliopistokoulutus/hallinto_ohjaus_ja_rahoitus/liitteet/uni_funding_

Institutional funding model for polytechnics (10 % of HEI institutional funding) has been revised (MEC 2014; Polytechnic reform 2011–2014⁷⁰): the governmental funding for polytechnics will be allocated in the ratio of 70:30 considering the number of degrees awarded and performance indicators.

Institutional funding of other Ministries for PROs is mainly pure block funding.

All of the funding of the Academy of Finland is competitive based on peer review, mostly international. Funding is allocated to HEIs and PROs. The traditional funding pillar of the Academy is formed by the four Research Councils. The Research Councils allocate funding for scientific research in the areas of Biosciences and Environment, Culture and Society, Natural Sciences and Engineering, and Health. As a part of the reform of the research institute and funding system, a new funding pillar was established in 2014 in the Academy: The Council for Strategic Research (CSR). Finally, the Academy is responsible for drafting the research infrastructure policy in the Finnish Research Infrastructure Committee (FIRI Committee).

All Tekes funding is competitive. Tekes funds for applied research in universities, research institutes and large companies, provides competitive grants and loans for development and innovation in SME's, grants and loans for YIC's (Young Innovative Companies). Tekes also funds start-ups, and through Tekes Venture Capital Ltd, a fund of funds, contributes to seed phase VC-investments. A special target of Tekes funding is to build incentives for cooperation and knowledge interaction.

Private non-profit (PNP) funders are mainly private foundations. Most of the funding was (2014) allocated to researchers in HEIs (62 %) and in PROs (11 %), and to PNP sector (24 %).

3.3.2 Funding sources and funding flows

Government budget appropriation or outlays for R&D in 2015 are presented in Table 5. In 2015 GBAORD amounted €2,002b; the share of MEC was 54 % while that of MEE was 31 %. The share of MEC has increased during recent years mainly due to additional funding to the Academy of Finland, and cuts in funding of VTT, other PROs and Tekes (Statistics Finland; R&D funding in state budget 2015)⁷¹.

Table 5 Government budget appropriation or outlays for R&D in 2015⁷²

	R&D funding € million 2015	Share of R&D funding, % 2015	Real change from 2014, %
R&D funding total	2002.5	100	0.6
Universities	578.0	28.9	-1.9
Academy of Finland	415.6	20.8	26.5
Tekes	488.2	24.4	-6.6
Government research institutes	256.2	12.8	-9.4
Other R&D funding	242.8	12.1	3.0
University hospitals	21.7	1.1	-31.9

model_2015.pdf

⁷⁰ http://www.minedu.fi/OPM/Koulutus/ammattikorkeakoulutus/ammattikorkeakoulu_uudistus/index.html?lang=en

⁷¹ https://www.tilastokeskus.fi/til/tkker/2015/tkker_2015_2015-02-26_tie_001_en.html

⁷² https://www.tilastokeskus.fi/til/tkker/2015/tkker_2015_2015-02-26_tie_001_en.html

According to the Statistics Finland, R&D funding from other public sources than the Government in 2014 was €85m (4.5 % of public funding). This is mainly R&D funded by the local authorities (municipalities).

International funding has grown since 2011 (€1,128m in 2014). Most of it is multinational's intramural R&D expenditures. EU funding has been growing steadily but slowly during the last years. In 2013 it was €185m but decreased in 2014 to €178m.

Although the private sector participates in the funding of the research carried out by the higher education and public sector, most of their funding naturally goes to private R&D. 97 % of the domestic private went to business sector in 2014. 80 % of R&D funding from abroad was directed to the private sector. Around 13 % of the foreign funding went to universities and 7 % to the public research organisations.

In 2014, most of the university funding came from various public sources (82 %), especially from the MEC but also from the funding agencies, the Academy of Finland and Tekes. The share of private sector (domestic and from abroad) in HEI funding was 5 % (€78m), and from abroad universities collected 10 %. The share of private sector (domestic and from abroad) in PRO funding was 11 % (€69m), and from abroad PROs collected 13 %. The share of EU funding of the international funding was in HEIs 75 % and in PROs 62 %.

International VC investments (institutional, private) indicating R&D related FDI can be estimated from the data of the FVCA (Finnish Venture Capital Association). Foreign VC/PE investments in 2014 were €50m, 0.025% of GDP⁷³.

The total EU funding that Finland received in the 6th Framework programme (FP6) was €327m and in the 7th Framework programme (FP7) €883m. The latter is 1.18 times the money Finland paid as the effective membership fee to the FP7 (Tekes 2014, Finland as a net receiver in the EU 7th Framework programme and EC statistics). Finland's share (% of EU total contribution) was in the FP6 2.1 %, in the FP7 2.2 %, and the share of participations in the ongoing H2020 is 2.2% (EC data). The EU funding that Finland received in H2020 (until 30.10.2015) was €200m, 1.12 times the money Finland paid as the effective membership fee to the H2020. The major change compared to the FP7 was a clear growth of SME participation. The share of funding collected by SMEs increased from 11% (FP7) to 22% (H2020).⁷⁴ Comparing the FP (Framework Programme) participation in Finland to other member states, the role of the FP programmes internationalising research has been and will be very important. Finland ranks fairly high in the number of programme participations per capita or funding received per capita. However, when measured against to the national R&D effort, Finland ranks low. Indeed, the RIC recommends increasing participation in the FP programmes by 50 %.

The structural funds (SF) programme 2014–2020, allocated under the Regional Competitiveness and Employment objective for Mainland Finland, will distribute a total of €1,299m, of which the share of the European Regional Development Fund (ERDF) will be €733m, while the European Social Fund (ESF) will contribute €536m (MEE; Finland's FP programme, in Finnish)⁷⁵. The share of ERDF allocated under RTDI priorities will be 41 %.

The absorption of the allocated SF funding 2007–2013 (under RTDI priorities) was 75–100% in all regions (IU Progress Report). As the private investments in R&D in Finland have been high, the relative role of the Structural funds has not been very significant for RTDI on the national level. Anyhow, the SFs have boosted regional activities in RTDI. The main challenge in the use of SFs on the previous period (2007–2013) has been the allocation of resources. Resources have been split into too many small projects with a regional or national focus.

⁷³ http://www.fvca.fi/files/931/VC_PE_Industry_in_Finland_2014.pdf

⁷⁴ http://www.tekes.eu/globalassets/tekeseu/nyt/tilastot/h2020-suomi-12_2015v3.pdf

⁷⁵ <https://www.tem.fi/files/42195/Ohjelma-asiakirja.pdf>

Responding to global challenges, specialisation, strategic choices, and focusing on forerunners have not been as clear as in the case of national funding. Thus the focus has not been very strong on renewing structures and the economy.⁷⁶

3.4 Public funding for public R&I

3.4.1 Project vs. institutional allocation of public funding

The legal framework for the allocation of R&D project and institutional funds has been stable for many years in Finland. Within the framework, the share of competitive funding increased until 2009 and then decreased until 2013, the decrease in 2009–2013 being 2 %. Starting in 2013, changes have been made to the framework itself, including the reform of research institutes and research funding, and new funding models for universities and polytechnics. However, the new government has made major changes in the public R&D funding. In 2015 €50m was taken from the institutional funding of universities to be allocated by the Academy of Finland as competitive project funding. The target is to build incentives for universities' change in strategic focus. On the other hand the cuts in Tekes funding mandate will decrease the share of project funding.

Looking at the government budget appropriation or outlays for R&D (GBAORD) in 2015 (see Table 5) the share of institutional funding for HEIs is 29 % and for PROs 13 % of the GBAORD. 45 % of GBAORD is allocated through Tekes and the Academy of Finland, which both fully operate within a competitive project funding framework. In 2014, 68 % of Tekes funding was allocated to the business sector, 24 % to HEIs, and 8 % to PROs. The Academy of Finland allocated 82 % to HEIs, and 9 % to PROs.

The category of *other public funding* (12 % of GBAORD) includes governmental funds allocated by ministries as well funds allocated by ELY-centres and regional councils (most of it structural funds). These are mainly competitive project funds. When estimating the share of institutional and project funding of GBAORD it is assumed that "Other public funding" is mostly project funding (as it probably is). Now, the share of institutional funding is 43 % and project funding 57 %. The share of project funding of GBAORD has decreased from 56 % (2009) to 54 % (2014) but increased again in 2015 to 57 %. At the same time competitive elements have been increased in institutional funding. The new recommendation by the RIC proposes a €210m increase in GBAORD by 2020, and 65 % of this increase would be competitive funding, but the government has decided to cut GBAORD by €153m in 2016 (see Chapter 2.2). On the other hand the planned spearhead projects of the government will change these figures.

3.4.2 Institutional funding

The share of institutional and project funding varies in HEI's and PRO's. Based on their budgets and action the share of institutional funding (for research) in HEI's was 42 % and in PRO's 49 % in 2013. According to the new performance and quality based funding model of universities ([Ministry of Education and Culture 2014; Universities Core Funding](#)) the government appropriations for universities (90% of HEI institutional funding) will be allocated on the basis of completed qualifications and credits as well as scientific publications and attracted competitive project funding. The funding model for universities will be revised again in 2017⁷⁷. Moreover, institutional funding for universities of applied sciences (10% of HEI institutional funding) ([Ministry of Education and Culture; Polytechnic reform 2011–2014](#)) is revised to better support improvement in the quality of teaching and research. The governmental funding for polytechnics will be allocated in the ratio of 70:30 considering the number of degrees awarded and performance indicators. So, institutional funding includes a strong competitive element for universities and a reasonable competitive element for polytechnics.

⁷⁶ https://www.tem.fi/files/36734/TEMjul_19_2013_web_04062013.pdf

⁷⁷ <http://www.minedu.fi/export/sites/default/OPM/Julkaisut/2015/liitteet/tr19.pdf?lang=fi>

The funding model for polytechnics will be changed again in 2017.⁷⁸ Institutional funding for PROs is mainly pure block funding.

3.4.3 Project funding

The share of funding (for research) from outside sources was 52 % in HEI's and 48 % in PRO's in 2014. Almost all of it was project funding, including Tekes and Academy of Finland funding, other governmental sources, international project based funding (especially FP and SF funding), funding from domestic enterprises and from other governmental sources.

Table 6 Institutional and project funding (€ million) for HEIs and PROs 2014

(Statistics Finland 2015, Research and development 2014)

Sector	Total funding	Institutional funding (incl. own capital)	Project funding		Project funding source
HEI	1486	710	776	266	Academy of Finland
				125	Tekes
				148	From abroad
				59	Domestic enterprises
				58	Domestic funds
				123	Other public funding
PRO	563	295	268	53	Tekes
				23	Academy of Finland
				47	Domestic enterprises
				77	From abroad
				68	Other public/Funds

As a result of the already briefly discussed reform of research institutes and research funding 19 % of institutional funding for research institutes will be subjected to competition. The objective was to make €70m available for project funding by. The budget will be reallocated from several sources in 2015–2017; including the state research institutes' institutional funding (€52.5m), the Academy of Finland's project funding (€7.5m) and Tekes' project funding (€10m). The Strategic Research Council (SRC), which will manage €55m of these funds, is located at the Academy of Finland, but the funding decision will make the State government. The funding of newly formed council is competitive and funding decisions are based on not only the scientific quality but also on the societal impact. Secondly, the reform creates another new opening: a funding pool for evidence based decision-making. The pool's funding will be increased to €12.5m, and is under the disposal of the government (led by the Prime Minister's Office). The pool provides project funding to enhance evidence based decision-making.

In Finland there are two main agencies who allocate most of the project funding for R&D: the Academy of Finland and Tekes. In 2015 the funds of the Academy are €415.6m. This includes funds (an increase of €50m) taken from the institutional funding of universities, targeting at strengthening the strategic focus of the universities. The Academy's funding is focused on scientific research and the funding decisions are based on international standards for peer review. The experts are mostly international.

⁷⁸ <http://www.minedu.fi/export/sites/default/OPM/Julkaisut/2015/liitteet/tr18.pdf?lang=fi>

The funding criteria of the Academy of Finland are:

- Scientific quality and innovativeness of the research plan
- Competence of the applicant/research team
- Feasibility of the research plan
- Cooperation contacts for the research
- Significance of the research project for the promotion of professional careers in research and researcher training.

In 2014, the Academy's funding was allocated to research projects (57 %), including thematic programmes (12 %) and the Centres of Excellence programme (9 %), to researchers (30 %), to research infrastructure (6 %), and international cooperation (7 %).

All of Academy and SRC programmes are thematic. The Academy's programmes are targeted at HEIs and PROs, and SRC programmes HEIs, PROs and BES. The funding criteria of the SRC include besides scientific quality also expected societal impacts.

The funding for researchers or individuals (€96m, 30 % of the Academy funding) was directed to

- Academy Professors €5.5m
- Academy Research Fellows €26.6m
- Postdoctoral Researchers €26.2m
- Research costs of research posts €28.8m
- FiDiPro €9.0 million

Further, in 2015 €50m more funds were allocated from Universities' institutional funding to the Academy to be used for boosting universities to focus on strategic choices and to better profile themselves.

All of Tekes funding is competitive based on funding instruments. These instruments are used in different funding concepts. In turns, strategic choices are made by using the concepts. About 60 % of the funding is allocated to the concepts (strategic choices) and 40 % of the funding is reactively based on demand. The major concepts have been Tekes programmes, Tekes campaigns, SHOK (Strategic Centres for Science, Technology and Innovation) programmes and start-up funding. The funding criteria of Tekes varies depending on the nature of the project but *in general the criteria includes the scientific or technological excellence, relevance to the economy and society, business and internationalisation targets and opportunities, cooperation, international cooperation, resources, economic status of a company and commitment of private financiers, risks, and business and project plans*. Starting 1st January 2016 Tekes renewed some of criteria to better boost the growth of exports.⁷⁹ The evaluation is made in-house by Tekes experts who have experience in both research and business. External experts can't be used because if the best experts on a certain industrial sector are used, they are competitors of the company who is applying for funding – and this causes a conflict of interest. An exception is the start-up funding – external experts from VC funds and business angel communities are used to evaluate pitches of start-up CEOs. Tekes provides funding for applied research in universities, research institutes and large companies, provides competitive grants and loans for development and innovation in SME's, and grants with a special instrument dedicated for YICs (young innovative companies). Tekes also funds start-ups and through Tekes Venture Capital Ltd, a fund of funds, contributes to seed phase VC-investments. A typical target fund of Tekes Venture Capital Ltd is a Finnish fund organised as a limited partnership company with a management company. Funding agreements follow the market practices, taking into account the additions described in the state subsidy programme of Tekes Venture Capital Ltd.

⁷⁹<http://www.tekes.fi/en/whats-going-on/news-2016/funding-news-from-tekes/>

These additions are connected with, among other things, restrictions in (or lack thereof) possible asymmetric distribution of profits of target companies, and demands associated with the fund's investment process and reporting.

Finally, a special target of Tekes funding is to build incentives for cooperation and knowledge interaction. In 2014 Tekes funding (€550m) was directed as follows: grants to HEIs and PROs €178m, grants to enterprises €230m, and loans to enterprises €141m (Tekes statistics, in Finnish)⁸⁰. Tekes funding decision mandate in 2015 is €594m which includes €44m Structural funds, and a mandate to operate €23m of other ministries funds (State budget 2015, in Finnish)⁸¹. Tekes funding mandate for R&D will be cut by 27 % in 2016.⁸²

The main concepts of Tekes for making strategic choices are programmes, changing campaigns and special funding concepts for HEIs and PROs. Tekes programmes are thematic focusing on Tekes strategic focus areas (natural resources and a sustainable economy, intelligent living environment, and vitality of people), and on Shared success factors of all sectors (Business concepts, Services and intangibility as value creators, and Digitalisation). The ongoing and recently completed programmes are listed in the Annex 2.

Tekes' Changing campaigns are a type of programmes directed especially to small and medium-sized enterprises and they are smaller than actual programmes. They can be targeted to certain sectors or themes that are important and topical from the standpoint of companies. The campaigns differ in their contents. They can offer, for example, calls and events. The ongoing campaigns are listed in the Annex 2.

The government has decided to cancel the special funding for the SHOKS.

Special funding concepts for HEIs and PROs are⁸³:

Public research network with companies

Tekes' most common funding instrument for research projects carried out by universities, polytechnics and research institutes. The funding is targeted to research projects that create new competence and solutions for identified needs of businesses and industries.

New knowledge and business from research ideas

In this project type research organisations develop an idea further while preparing for the commercialisation of the idea into new business.

Strategic research openings

Strategic research openings create new high-level competences in areas expected to be important for businesses in the future.

Horizon 2020 funding and funding for Horizon 2020 project preparation

Tekes encourages PROs and HEIs to focus on topics of the Horizon 2020 programme and also funds preparing of projects and promoting of Finnish companies' Horizon 2020 participation.

⁸⁰ <http://www.tekes.fi/tekes/tietopankki/>

⁸¹

http://budjetti.vm.fi/indox/tae/frame_year.jsp?sessionid=3794E8DA16C51DD6B0EE5A45FE000BAA?year=2015&lang=fi

⁸²

[http://budjetti.vm.fi/indox/sisalto.jsp?year=2016&lang=fi&maindoc=/2016/tae/valtiovarainministerionKanta/valtiovarainministerionKanta.xml&opennode=0:1:245:1049:1071:1079:](http://budjetti.vm.fi/indox/sisalto.jsp?year=2016&lang=fi&maindoc=/2016/tae/valtiovarainministerionKanta/valtiovarainministerionKanta.xml&opennode=0:1:245:1049:1071:1079;)

⁸³ http://www.tekes.fi/en/funding/research_organisations/

Tekes funding for companies includes (as a part of a programme or campaign or outside them):

- Funding for Planning for global growth
- Funding for Research projects carried out by companies
- Funding for Development and piloting
- Funding for Young innovative companies
- Funding for Workplace innovations

Public programmes offering project-based funding in Finland are thematic, meaning that strategic focus is important. This is considered to be must in a small country. Programmes' priority-setting responds well to societal challenges because the programmes are planned and prepared in wide cooperation between various stakeholders. According to the evaluations (see 2.2 and Annex 3), impacts of the programmes are mostly well in line with the objectives.

Most of the project funding in Finland is focused on research teams, multidisciplinary research, cooperative research and innovation-targeted research. The rationale for this is to enhance trust as the way reach better societal impacts. This has always been the rationale of the Tekes funding but today also the Academy funding is expected to reach and to be able to measure societal impacts.

3.4.4 Other allocation mechanisms

Ministries' and Tekes' activities include minor amount of contract research. These mechanisms include non-allocated research funding of the ministries, in particular the cross-ministerial funding for policy-relevant research by Prime Minister's office (*TEAS*), €11m for 2016 (budget proposal), and government appropriations to research at university hospitals, €15m in 2016 (budget proposal).

3.5 Public funding for private R&I

3.5.1 Direct funding for private R&I

In 2011 BERD financed by direct and tax funding (% of total BERD) was 2.85 % in Finland⁸⁴.

The public innovation ecosystem, i.e. the funding streams to cover the entire R&D&I process from fundamental research to market innovation are in Finland organised as cooperative services of funding organisations and as public private partnerships. The concepts are based on the experience that the innovation process is not a linear chain from basic research to commercialisation but an interactive process where activities are concurrent and parallel. Tekes resources are targeted to innovation. Public-private-partnerships are typical in cases when Tekes is funding universities, research institutes or large companies. Indeed, the partnerships are prerequisites for funding. Tekes programmes and SHOK programmes include projects, which are led by, and involve, public and private sector participants, and there is also cooperation between the projects. Tekes programmes are always thematic and by nature *Innovation programmes*. In later phases of the innovation process there are many cooperative funding and service concepts like Viko and Team Finland (see chapter 2.2).

Tekes funding for universities and research institutes includes concepts like *Public research networked with companies* and *New knowledge and business from research ideas* where companies are involved in research projects. About half of the cooperation between universities, research institutes and companies in Finland is partly funded by Tekes. The major types of innovation funding and funding streams improving access to finance for innovative companies are described below.

⁸⁴ <http://stats.oecd.org/>

The total funding of Tekes is channelled through different concepts, which are:

- around 40% for customer initiatives based on demand;
- around 20% for research programmes of the Strategic Centres for Science, Technology and Innovation (SHOK);
- around 25% to focus areas through Tekes programmes;
- around 15% to other strategic choices.

Termination of the special funding for SHOK programmes, termination of INKA programme, and cuts in Tekes funding will change the above mentioned shares, starting in 2016.

Public project funding for business R&D in 2014, according to Statistics Finland⁸⁵, was €223m. Most of the funding came from Tekes, and almost half of it were loans. The share of loans was 2.3 % and the share of grants 2.8 % of the R&D expenditures of the enterprises. 76 % of the Tekes funding was directed to SMEs and 24 % to big companies co-operative research.

The cuts in Tekes funding in 2016 will change the above mentioned shares starting in 2016. It's obvious that the share of SMEs will grow, and co-operation between companies and HEIs and PROS will decrease. There are no tax incentives for business R&D in Finland. Thus the incentives for business R&D are very low in Finland compared to other OECD countries⁸⁶.

In particular, Tekes programmes and the programmes of the Strategic Centres for Science, Technology and Innovation (SHOK) have integrated public and private resources. The SHOKs are private companies including public-private networks that engage in intensive and long-term work to achieve shared goals. The introduction of the SHOK concept has created important structural changes in Tekes funding to selected strategic areas but this will change due to the decisions by the government.

Tekes has been the main funder of SHOK programmes. In addition, the Academy of Finland has allocated a small amount of funding using a special application process on the fields of SHOK research but the grantees are HEIs and PROs. The new funding pillar (SRC) located at the Academy of Finland is mandated to fund cooperative research, also private companies (see Chapter 3.4.3).

Additionally Finnvera, TESI and ELY-Centres all have instruments related to innovation. Most of these instruments are related to general funding or financing for businesses but in many cases these also target development and (innovative) start-ups (see Chapter 1.2.2). Finnvera's role is crucial in the commercialisation phase of innovation processes, although it is not focused on innovations. Even though the share of Tekes customers among Finnvera customers is only 10 %, the share of Finnvera customers among Tekes customers is 60 % in a longer time span. Finnvera is a specialised financing company owned by the State. Finnvera provides financing for the start, growth and internationalisation of enterprises and guarantees against risks arising from exports (see Chapter 1.2.2). Finnvera strengthens the operating potential and competitiveness of Finnish enterprises by offering loans, domestic guarantees, venture capital investments, export credit guarantees and other services associated with the financing of exports. The risks included in financing are shared between Finnvera and other providers of financing. Finnvera's SME financing issued in 2014 was €1b and Export credit guarantees and special guarantees €5b. Finnvera's mandate and risk taking were enlarged in 2015 (Finnvera News 01.2015)⁸⁷.

⁸⁵ http://pxnet2.stat.fi/PXWeb/pxweb/fi/StatFin/StatFin_ttt_tkke/?tablelist=true

⁸⁶ <http://ifuturo.org/documentacion/Science%20Technology%20and%20Industry%20Outlook%202014.pdf>

⁸⁷ [https://www.finnvera.fi/eng/Finnvera/News/\(newsid\)/3641](https://www.finnvera.fi/eng/Finnvera/News/(newsid)/3641)

Start-ups and young innovative companies (YIC) need a different kind of financial ecosystem. The funding for start-ups and YICs is a good example of concurrent initiatives (private and public, top down and bottom up) in Finland (see Chapter 5.2). Early stage VC funding seems to be developing (see Chapter 5.4), and Finnvera's enlarged mandate offers better opportunities for financing commercialisation, growth and internationalisation of R&D results. Public-private partnerships are enhanced especially by Tekes funding concepts. However, the incentives for private sector R&D investments are weakening. Challenges still remain related to producing new good business ideas and collecting private equity for later stage growth.

Services for internationalisation were integrated to operate as the Team Finland concept⁸⁸ (see Chapter 2.2).

The priority setting of the programmes aimed at funding private sector, too, (Tekes programmes) is a combination of top-down and bottom-up processes. Societal challenges and global megatrends defined in cooperative foresight processes define the general theme of the programmes. Preparation of individual programmes involves participants from all sectors: BES, HEI and PRO. The decision to start a programme depends on the commitment of enterprises to funding and to performing their own projects. Funding criteria are very clear to all participants because they are the same for all programmes and tailored for different customers. Peer reviews are not used due to the confidential information of company plans. However, all programmes, as well as, funding schemes (instruments) are regularly evaluated. International benchmarks are done occasionally – they could be more regularly used. The impacts of the programmes depend on the nature of the programme (see Annex 2) but all the programmes intensify business-academia cooperation. Finland was ranked #1 in university-industry collaboration in R&D by the WEF Global Competitiveness Report 2015–2016⁸⁹ and the Global Innovation Index 2015.⁹⁰

3.5.2 Public Procurement of Innovative solutions

The total value of public procurement in Finland was €33.09b Euro in 2012, equal to approx. 17.20% of GDP.⁹¹ The public sector has a significant role in the development and renewal of markets (e.g. health, social services, environment, construction, and transport) and municipalities represent 2/3 of procurement volume.

PCP/PPI landscape

Both the Public Procurement Act (348/2007) and the Government Decree on public procurement (614/2007) implement Directive 2004/18/EC. Procurement in the water, energy, transportation and postal sectors: The Act on public contracts in the utility sectors (349/2007) implements Directive 2004/17/EC. Defence and security procurement: The Act on Public Procurement in Defence and Security (29.12.2011/1531) implements Directive 2009/81/EC⁹². The Public Procurement Act (348/2007) excludes from the scope of public service contracts research and development services other than those where the benefits accrue exclusively to the contracting authority for its use in the conduct of its own affairs, on condition that the service provided is wholly remunerated by the contracting authority.

⁸⁸ http://www.tem.fi/en/enterprises/promoting_internationalisation_of_enterprises/team_finland

⁸⁹ <http://reports.weforum.org/global-competitiveness-report-2015-2016/>

⁹⁰ <https://www.globalinnovationindex.org/userfiles/file/reportpdf/GII-2015-v5.pdf>

⁹¹ 2014, European Commission, DG Internal Market study:

http://ec.europa.eu/internal_market/publicprocurement/docs/modernising_rules/20141105-indicators-2012_en.pdf

⁹² See: <http://www.finlex.fi/en/>

Finland intends to implement the remaining optional features of the mentioned Directives, i.e. dynamic purchasing systems and electronic auctions, at a later date. The government proposal is still being finalised, with a Parliamentary reading possibly starting in March 2016. New Acts include a section on innovation partnership and a definition of innovation

Prior to 2009 the role of innovation oriented public procurement was modest in Finland but the development of public procurement in research and innovation policies is underway and high on the political agenda. For instance the Research and Innovation Policy Guidelines for 2011–2015⁹³ (2010) placed emphasis on public procurement by referring to it as one of the key tools of demand driven innovation policy. The development of public procurement is also one of the key themes in the Action plan (Ministry of Employment & Economy, MEE) and Policy framework for demand and user-driven innovation⁹⁴. Finland's national innovation strategy defines public procurement as a demand driven innovation policy tool. The intention is to develop public procurement practices, in order to create opportunities for and encourage innovative procurements. The action plan also refers to the reform of the Act on Public Procurement. The reform is based on the revision of the public procurement Directives announced in 2013. The main barriers in implementing demand-side policies in Finland are the small domestic markets and to some extent the dispersed local government sector. As a result active participation of Finnish organisations to the EU Lead Market is seen as a very important approach in the action plan by the MEE. On the other hand the small markets can possibly work as an efficient pilot market for global innovations.

PCP/PPI initiatives

TeKes had a programme for piloting public procurement of innovation – 70 projects were funded 2008-2013 with the main focus areas of construction and real estate, social and health care, energy and environment, and water supply. It provides a financial incentive for public procurers in Finland to undertake more "innovative" procurements. TEKES funds the planning of public contracts aiming at renewal of services and activities. This funding is targeted at all Contracting Authorities, and it typically covers 50% (depending on type of cost, funding can vary between 25% and 75%) of total project costs. The procurement must be extensive enough to have an impact on the development of the sector, at least regionally. The planning and preparation of an innovative procurement should encourage active dialogue with potential tenderers and end-users. Additionally, strategic commitment to an innovative procurement is expected from the Contracting Authority. Budget for and number of PPI projects have risen constantly, starting with 1 in 2008, 5 in 2009 and reaching 25 in 2012 and a funding available of €2.5m.

The aim of the new Smart Procurement programme (2013 - 2016)⁹⁵ is to create smart demand, which will provide the prerequisites for new market creation and growth. The main focus areas for the programme are those areas in which the public (or private) procurement has a major impact on the market: *energy and environment, ICT, health care, built environment, security and safety and private strategic procurement*. Furthermore, smart procurement is integrated as a theme in some other programmes, too. The programme budget is about €60m of which TEKES covers half.

⁹³ http://www.minedu.fi/export/sites/default/OPM/Tiede/tutkimus- ja_innovaationeuvosto/julkaisut/liitteet/Review2011-2015.pdf

⁹⁴ https://www.tem.fi/files/27547/Framework_and_Action_Plan.pdf

⁹⁵ <http://www.tekes.fi/en/programmes-and-services/tekes-programmes/smart-procurement/>

Moreover, the INKA programme (recently ended) included objectives related to innovative and precompetitive public procurement, and the Growth agreement between the state and the 12 largest cities include commitments of these cities to implementing innovative and precompetitive procurement.

Procu-Inno (2011-2013) – a research and development project (funded by TEKES) focused on public procurement of innovation in Finland. The project was coordinated by VTT and the City of Helsinki, City of Pori and the Finnish Transport Agency. Procu-Inno analysed a selection of Finnish procurement projects, prepared case studies, elaborated a framework for managing the innovation procurement in Finland and furthermore set up a collaboration platform for practitioners. Procu-Inno also promoted PCP: it created a Finnish research network on this topic and supported pre-commercial public procurement approaches and applications in Finland. It is thematically open and has no specific mobility focus.

Since 2012 TEKES began initiatives to promote PCP, allocating a budget of €6m to co-finance 4-5 PCP projects.⁹⁶ A pilot project, funded by FP7 emerged in 2012 – called Silver – Forum Virium Helsinki is one of its partners⁹⁷.

Under the R&I action plan 2012 – Cleantech – a Finnish national project related to the environment was a first strategic target area for the public procurement of innovations. The aim was to set a target percentage to enhance the adoption of sustainable solutions in the field of Cleantech that promote innovation activities. An objective was set to direct 1% of public procurement towards the purchasing of new solutions in the Cleantech field (Proposed measure 18: Ministry of Employment and the Economy, Ministry of the Environment). The generation and diffusion of innovations is promoted by setting a target percentage (such as 2 or 3%) for public procurement that enhances research, development and innovation activities. Expertise in procurement is enhanced by strengthening and developing comprehensive support and advisory services in matters of public procurement related to innovation. Financial and other incentives for procurement related to innovation were developed as part of the Effectiveness and Productivity Programme of central government and the productivity programme of municipalities (Proposed measure 19: Ministry of Employment and the Economy, Ministry of Finance).

Smart Kalasatama

Aims to experiment intelligent city planning – development projects, up-to-date public transport information, ride-sharing for goods and the digitalised monitoring of the condition of the buildings. It includes 5 agile piloting projects.

DreamBroker

A learning and communication solutions initiative, in which public procurements had a crucial impact on development. It was listed as Finland's fastest growing technology company in 2012.

RAKLI - Innovation procurement clinics

The Procurement Clinics scheme run by RAKLI (the Finnish Association of Building Owners and Construction Clients) is designed to facilitate dialogue between public sector clients and potential service providers. Workshops involving clients, suppliers and other relevant actors analyse a specific procurement problem indicated by a client, and publicly present identified solutions.

⁹⁶ Experience from development of policy instruments for PPI in Finland:

http://www.vtt.fi/files/sites/procuinno/procuinno1602_lundstrom.pdf

⁹⁷ <http://www.silverpcp.eu/>

UDI (User-Driven Innovation)

The purpose of the website is to describe some of the benefits of user-driven innovation for society and businesses. The cases describe a few Finnish examples of how closer cooperation with users has resulted in more pleasant and higher-value products and services⁹⁸.

3.5.3 Indirect financial support for private R&I

In Finland governmental support to research and innovation has mainly been channelled through direct funding and this seems to continue. Indirect funding measures have been used three decades ago and again in 2013–2014. The government budget for 2013 included two tax incentives aimed at growth seeking businesses. The Tax Incentive for Private Investors targets business angels investing equity in SMEs. The incentive provides a possibility to postpone paying capital gains taxes as long as those gains are re-invested in qualifying businesses. The R&D Tax Incentive was a deduction from corporate income taxes tied to the wage costs of R&D personnel in Finland. The total sum of deduction in costs was €65m in 2013 causing €15m loss in tax revenues. In 2014, the government decided to terminate it due to the lowering of corporate tax (State budget 2014), and because the R&D tax incentive presumably doesn't have any impact on adding R&D investments of enterprises when direct funding has been measured to have an additionality of 2 (Ali-Yrkkö J. 2008 and Einiö E. 2009). This will be re-evaluated in the evaluation of the tax incentive scheme. Starting 2015 the only special tax incentive for R&I is targeted to Business Angels. The new government Programme includes a proposal that donations (€850 - €0.5m) to HEIs made by individuals will be deductible in taxation, as well as a decision to continue tax relief for foreign key employees.

3.6 Business R&D

3.6.1 The development in business R&D intensity

Figure 7 shows the GDP share of BERD decrease since 2010 to below 2005 levels. The decline is more evident after 2011 and is related to the severe drop in R&D expenditure in manufacturing in the period 2011-2012. A small part of these overall decline in BERD were compensated for by an increase of R&D expenditure in services, notably in both ICT and professional activities sectors. Equally, the share of services is very high (up to 50% in many manufacturers) among manufacturing companies at present, and therefore a much greater share of BERD is focused on services than the statistics indicate. Manufacture and Services account for more than 97% of the BERD expenditure in the period under study but the relative shares have changed and the gap between the two has reduced. In fact, BERD in manufacture went from 2.07% of GDP in 2010 to 1.62% in 2013 whereas BERD in the service sector increased from 0.46% to 0.59% of GDP during the same period.

⁹⁸ <http://udi.fi/en>

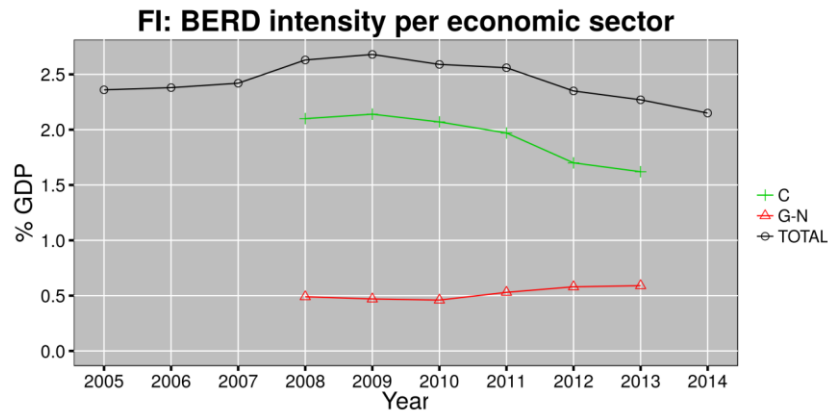


Figure 7 BERD intensity broken down by most important macro sectors (C= manufacture, G_N=services).

The private sector (curves C and G-N describe BERD intensity of domestic companies, not of private (C and G-N) sector altogether) is the main funder of the Finnish BERD. However, from 2012 its contribution is reduced and at the same time R&D funds from abroad become more important due to major enterprises' changed ownership arrangements.⁹⁹ As a result, the gap between the business contribution and the total BERD widens in 2012-2014.

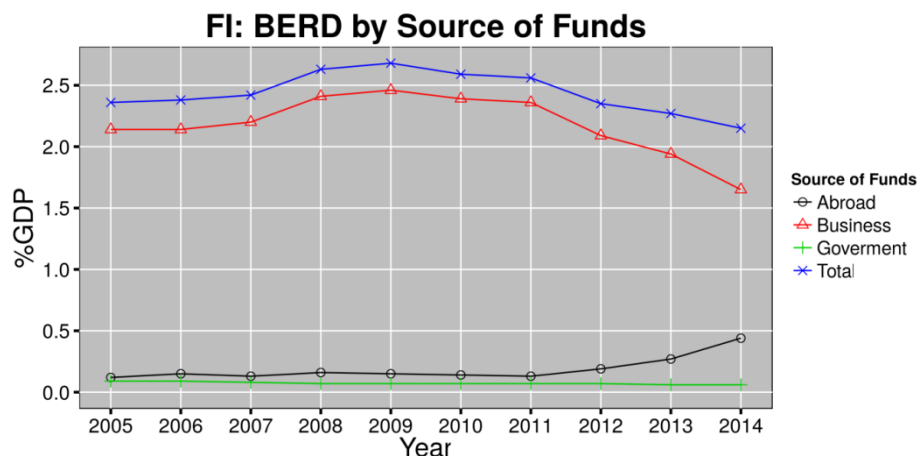


Figure 8 BERD by source of funds

3.6.2 The development in business R&D intensity by sector

Manufacture of computer, electronic and optical products is the leading sector in terms of R&D expenditure in Finland. Figure 9 (Business is Domestic business and Abroad includes foreign business funds) shows a mild negative trend in the R&D expenditures in this sector from 2008 to 2011 followed by a sharp decline in 2012. The following year R&D expenditure dropped further. According to Statistics Finland, in the electronics industry, R&D expenditure went down by EUR 14 million in 2014 compared to the previous year. As a dominant player in this sector, Nokia's R&D intensity saw a negative growth over a 3 year period of -11.2%.

⁹⁹ http://www.stat.fi/til/tkke/2014/tkke_2014_2015-10-29_tie_001_en.html

Smaller companies in the field such as Tieto (still a fairly large company) and Vaisala also saw similar decreases (-3.3% and -2.0%).¹⁰⁰. The other two leading sectors, i.e. manufacture of electrical equipment and manufacture of machinery and equipment have not experienced similar drops. On the contrary they both show increasing trends but the amounts involved are not of the same scale.

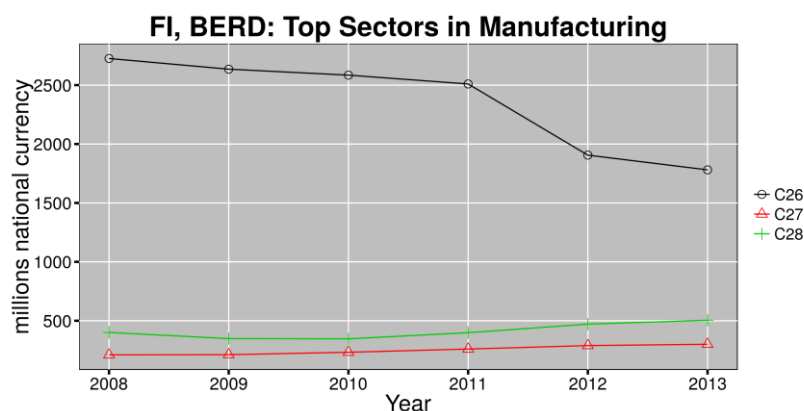


Figure 9 top sectors in manufacturing (C26=manufacture of computer, electronic and optical products; C27= manufacture of electrical equipment; C28=manufacture of machinery and equipment n.e.c).

As far as services are concerned, there is a significant increase of the R&D expenditure in the information and communication services after 2009, particularly in 2013. R&D expenditure in IT services increases whereas at the same time it decreases in the manufacture of computer, electronic and optical products. In other words regarding the IT sector we observe a shift of the R&D activities from manufacture to services. Professional, scientific and technical activities comprise the second most important in terms of R&D expenditures type of services. The negative trend between 2008 and 2010 was followed by a sharp increase in 2011 which continued in 2012 and stagnated in 2013. Finally, R&D expenditures in wholesales are stable and considerably lower than the previous two sectors, with only one peak in 2012.

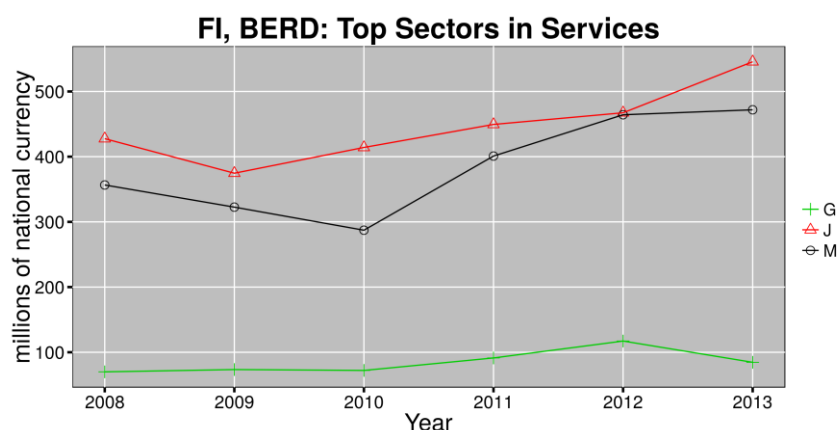


Figure 10 top service sectors:

J=information and communication, M=professional, scientific and technical activities, G=wholesale and retail trade; repair of motor vehicles and motorcycles

¹⁰⁰ Industrial R&D Scoreboard: <http://iri.jrc.ec.europa.eu/scoreboard14.html>

3.6.3 The development in business R&D intensity and value added

Manufacturing is, by a clear margin, the biggest contributor to Gross Value Added (GVA) in Finland accounting for 15.4% in 2012, which is very close to the EU average. However, its share significantly decreased in recent years from 23.3% in 2007 to 15.4% in 2012. Part of this decline is due to the contraction of the manufacture of computer, electronic and optical products sector (C26) whose value-added declined from over 8 billion in 2007 to less than 800 million in 2012.

Real estate activities and human health and social work activities show an increasing share in the total GVA throughout the period 2007-2012, whereas the contribution from wholesale and retail trade fluctuates slightly over the years.

Within manufacturing, the biggest sector in terms of GVA is manufacturing of machinery and equipment n.e.c., which is also one of the leading sectors in terms of BERD, followed by manufacturing of paper and paper products and manufacturing of food products; beverages and tobacco products, both of low technological intensity (See Figure 11). *Manufacturing of chemicals and chemical products* should also be noted: its production in 2014 was €25b; its share of manufacturing has increased from 16% (2010) to 20% (2014) by production, and from 13% (2010) to 15% (2014) by added value. Employment of the Chemical industry has been quite stable when other sectors have been struggling.

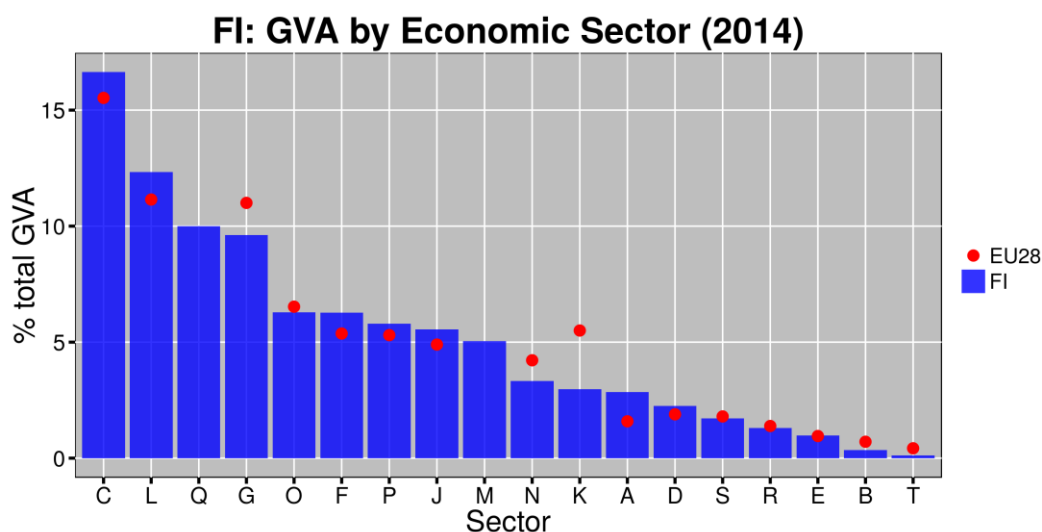


Figure 11 economic sectors as percentage of the total GVA.

Top 6 sectors in decreasing order: 1) manufacture, 2) Real estate activities, 3) wholesale and retail trade (repair of vehicles and motorcycles), 4) Human health and social work activities; 5) Construction; 6) Public administration and defence; compulsory social security

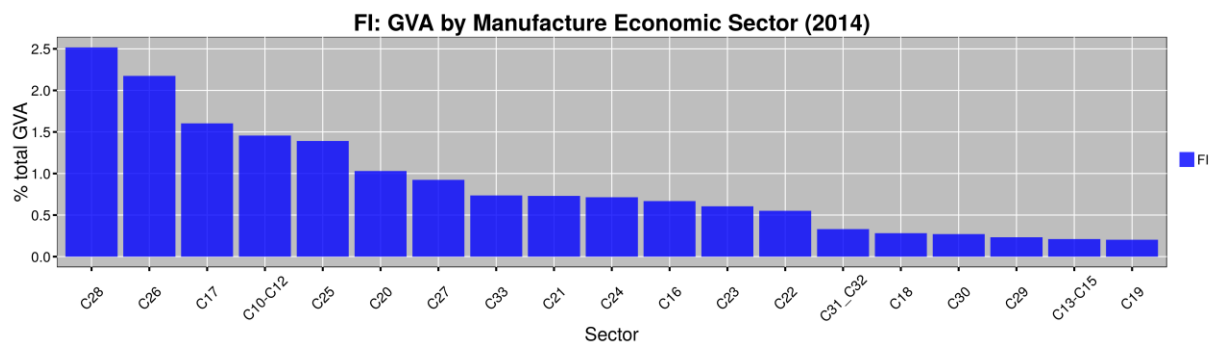


Figure 12 GVA in manufacturing. Top 6 manufacturing sectors:
 1) Manufacture of machinery and equipment n.e.c.; 2) Manufacture of paper and paper products;
 3) Manufacture of food products; beverages and tobacco products; 4) Manufacture of fabricated metal products, except machinery and equipment; 5) Manufacture of chemicals and chemical products; 6) Manufacture of electrical equipment

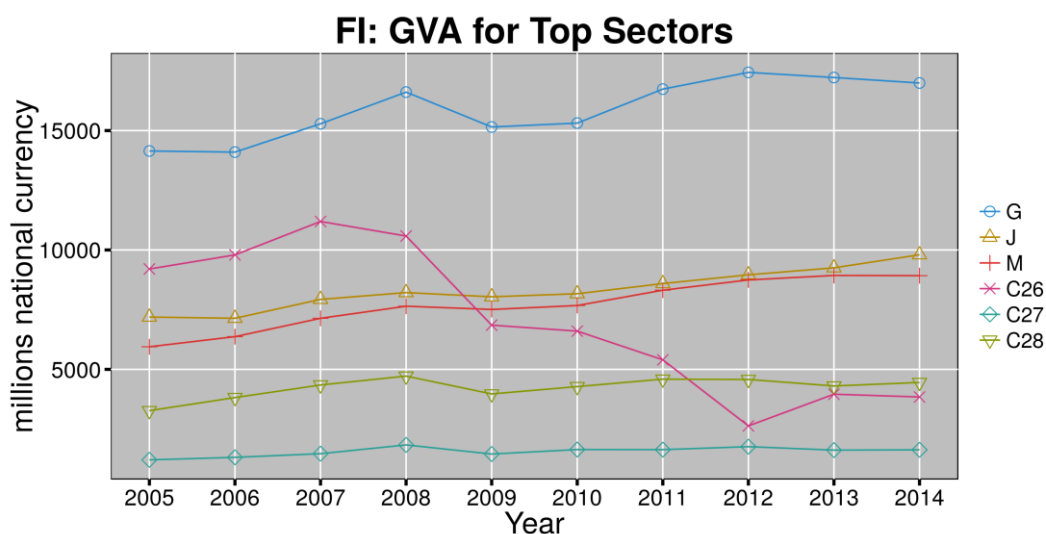


Figure 13 Value added for the leading sectors

It is clear from figure 13 that the largest R&D performer in Finland - computer manufacturing , electronic and optical products - not only dramatically decreased in R&D intensity but also lost 90% of its Added Value in the period 2007-2012. The increasing share in the export-market of competing products in this sector (e.g. smart phones) from emerging players, along with the weakening cost competitiveness, e.g. high cost of labour in Finland helps explain the trends during this period.¹⁰¹ Employment in this sector follows a similar trend with losses of about 35% between 2008 and 2013.

Finland's high-growth enterprises increased in 2012-2013 as did their overall share of the firm-landscape, especially in the manufacture of machinery and equipment in all BERD intensive sectors under study apart from computer manufacturing (C26). Employment trends in Finland are mixed – some sectors saw decreases in overall employment (manufacture of electronics, electrical products and ICT), and increases for retail and professional, scientific & technical activities. The numbers of highly skilled employees increased in all four sectors 2008-2014, indicating the importance of highly skilled workers in the knowledge economy.

¹⁰¹ See Country Report 2015

3.7 Assessment

The role of private sector in the Finnish R&I system is strong. The share of GERD performed by the BES (Business Enterprise Sector) 68 %, and 66 % was funded by the BES in Finland in 2014. The relatively high share of private funding is positive and a clear target. Segmenting private R&D expenditures based on the company size, 77 % of the R&D was executed by large companies, 4 % by micro companies and 19% by other SMEs in 2014. Thus, Finland's R&D is dominated by large companies. The moderate role of the SMEs is a challenge for Finland. Foreign affiliates' share has increased in 2015 but is still quite low, 20 % of the Business sector R&D expenditures, indicating modest internationalising of the economy. Public funding of private sector's expenses on R&D is very low, about 3%. These incentives are mainly focused on SMEs and start-ups, and their impacts have been proved to increase private investments in R&D but stronger incentives for the whole business sector would be needed for leveraging business expenditures in R&I as well as for increasing the relevance of public research for businesses. The government has shifted the focus from direct grants to refundable forms of funding which will lower risk taking and change the focus on near to market interests instead of building knowledge capacity for innovation.

Public research organisations perform about 10 % and the higher education institutions around 22 % of all R&D activities in the country. The share of public research funding (0.96 % of GDP) is quite high. Still the quality and output are in need to be strengthened. Project funding (57 %) is dominating over institutional funding (43 %), and institutional funding especially for universities include competitive elements, too. Competition is targeted to increase the quality but a low rate of internationalising and a dispersed HEI and PRO system are challenging the targets. That's why the government is reforming the system. The trend seems to be to incentivise universities performance to increase outputs.

International funding has been growing since 2011 (17 % of GERD in 2014). Most of it is multinational's intramural R&D expenditures. EU funding has been growing steadily but slowly during the last years. In 2014 it was 2.7 % of GERD, mostly FP funding. The role structural in R&D funding is minimal. Internationalisation is a clear challenge for Finland.

Private R&D intensity in Finland saw a general decrease since 2005 although it is still at a high level in comparison to other leading EU countries. Manufacturing R&D decreased, in particular in the computer, electronic and optical products sector, an important part of the Finnish economy, while services saw a gradual increase since 2011, though it doesn't offset the overall losses. There are also signs that high-growth enterprises are successfully increasing in many sectors and increasing their share of the overall firm base, except for the sector manufacture of computer, electronic and optical products. Employment is mixed across sectors, although a general trend since 2008 is an increase in highly skilled workers across all sectors. Finland recently reported on a decline in the business sector's share of R&D expenditure from 74% to 68% per cent in 2008 to 2014. In 2015, R&D expenditure is estimated to fall by EUR 45 million, putting its GDP share at no more than 3.1%.¹⁰²

¹⁰² http://www.stat.fi/til/tkke/2014/tkke_2014_2015-10-29_tie_001_en.html

4. Quality of science base and priorities of the European Research Area

The Finnish R&I system is active and has a long track record in addressing ERA priorities as discussed in connection with the national challenges. However, there also is a clear need for further development. For a small country with limited resources, the European dimension is seen as a logical extension of the national policy. In its recommendations for 2015–2020, the Research and Innovation Policy Council stated that Finland is a proactive partner in the European research and innovation policy.

4.1 Quality of the science base

The Academy of Finland publishes every few years¹⁰³ a thorough assessment of the state of scientific research in Finland. The latest report, [The State of Scientific Research 2014](#) concludes that Finland's position in the scientific world community has remained fairly unchanged throughout the 2000s. At the same time, however, many other countries have picked up speed and are now making strides forward. Finland ranks just above the average but is behind the other Nordic countries, and the gap to the top performers seems to be growing. According to the report, Finnish science is in danger of falling further behind. It notes that Finnish universities and research organisations will have to make an increasing number of strategic choices, focus on their strengths and step up collaboration, and invest in new initiatives that might emerge therefrom. The disciplines hosted by Finnish universities are often quite small, and the same disciplines may be represented at several universities at the same time. The number of publications in Finland grew steadily in the 2000s. During the years 2009–2012 the number of publications grew up to 28,000 (publications by researchers working in Finland). The Web of Science (WoS) top 10 index is 1.04. The number of researchers at the very top of their field remains low in Finland. Finland needs more high-quality, leading-edge research. Regarding the importance of internationalising research, it is important to note that according to the bibliometric results of the Academy's report international cooperation increased the impact of the research significantly.

Finnish universities in general do not fare so well in international comparisons. The only Finnish university ranked in the top-100 of the Shanghai ranking in 2014 was the University of Helsinki (67th). In 2015, Helsinki University was for the first time ranked amongst the 100 best universities (73rd) also in the Times Higher Education World University Ranking. Also OECD STI Outlook ranks Finland among the top-5 based on the top-500 universities (per GDP). However, most Finnish universities reach a mid-table ranking in the international university rankings partly due to international excellence being focused on few fields, and also due to the small size of universities. The regional policies of Finland may have also affected the level of science in several Finnish universities: several are established in remote locations based more on equal regional policy than actual demand. Student–teacher ratios are lower in Finland than in the top universities of the world. Finally, Finnish universities used to offer only few regular postdoc vacancies but the new tenure track system will probably change this.

The quality of research and its efficient use in society is linked with the structure of the research system. According to the international evaluation of the Finnish research and innovation system (MEE & MEC, 2009) the Finnish higher education and public research system is fragmented, which makes it more difficult to focus resources and to provide high-level research. According to the evaluation the system can be seen as fragmented in three dimensions. Firstly, resources are scattered in three different types of organisations with overlapping tasks – universities, polytechnics and public research organisations (PROs).

¹⁰³ During 2000–2012 the report was published every third year, and since 2014 every second year.

Secondly, these institutions are scattered around the country with several rather small units. Thirdly, the universities have been internally fragmented in several rather small units.

In total, there are 14 universities in Finland that conduct research in 54 fields of science that further are divided into 297 units. From these 54 fields 27 are represented in six or more universities. The level of research was not clearly above the world average in any of these 27 fields (top 10 index > 1.15). Therefore, there is a clear need to prioritise and make strong strategic choices to decrease fragmentation and aim at increasing the critical mass. There are 26 polytechnics (also known as Universities of Applied Sciences), and 12 public research institutes, which also have several regional extents.

According to a recent study by the Ministry of Education and Science, the Finnish universities produced on average 37,000 publications between 2011 and 2012, generating 51,400 publication scores. Altogether 19,800 authors were involved in producing these publications, resulting in an average publication score of 2.6 per author. The volume of World of Science publications in universities has increased from just over 14,000 between 2000 and 2003 to 18,400 between 2009 and 2012. The citation index rate is back to the same level as in the early 2000s (1.08). Despite the rise in the citation index, Finland's ranking between the OECD countries has deteriorated.¹⁰⁴

Table 7 Basic indicators for the scientific performance

Indicator	FI	EU average
Number of publications per thousand of population (2013)	2.99	1.43
Share of international co-publications (2013)	53.6%	36.4%
Number of international publications per thousand of population (2013)	1.60	0.52
Percentage of publications in the top 10% most cited publications (2000)	13.3	10.55
Share of public-private co-publications (2011-2013)	2.5%	1.8%

Although the Finnish universities' ranking is fairly low, the position of Finnish research in international comparison is reasonably good and stable. At the same time, Finland has a strong history in investing into education and science, which should also be reflected in these numbers. Finnish contribution to world science remains limited simply due to the small size of its population and research community. There are also a number of areas in the Finnish research system that would require further development and strengthening. Typical challenges are those related to fragmentation into many small universities and research units that lack sharp focus and benefits of scale. Recently introduced government budget cuts to higher education and research raise many concerns about the future trends of Finnish research.

¹⁰⁴ Productivity and impact of Finnish university research, Ministry of Education and Culture, 2015:5

4.2 Optimal transnational cooperation and competition

Given that Finland is a relatively small country, participation in cross-border joint initiatives has typically been valued high on the R&I agenda. Finland has participated in 45 ERA-NET networks as of 2013. Although there is no overarching legislation governing Finland's participation in European research, the strategies of the main actors (funding organisations, HEIs, PROs) support selectively joint projects with partners in the other Member States.

The research agendas of EC and those of the other countries are taken into account when new programmes are prepared in Finland. In the case of Tekes and SHOK programmes also global market studies are made. Typically, Tekes programmes have a direct connection to European programmes and they prepare and support the programme participants to take part also in European programmes. Ex-post evaluation procedures are implemented in major programmes. Tekes implements both mid-term and ex-post evaluation processes in all of its programmes, funding instruments and funding concepts.

The new recommendation by the RIC recognises that Finland has not utilised the opportunities offered by European and other international research funding to a sufficient degree. It recommends increasing the participation in the EU Framework Programme by 50 % and creating a special funding instrument for planning international projects and preparing for FP projects.

Finland is well represented in the European cooperative research landscape, being a member of all major pan-European research organisations and infrastructures (like European Organisation for Nuclear Research CERN, European Molecular Biology Laboratory EMBL, European Space Agency ESA, European Organisation for Astronomical Research in the Southern Hemisphere, European Synchrotron Radiation Facility ESRF, ITER – International Thermonuclear Experimental Reactor, European Southern Observatory ESO, and GSI/FAIR – Facility for Antiproton and Ion Research).

4.2.1 Joint programming, research agendas and calls

At the European level, Joint Programming aims at building a common approach for addressing major societal challenges or opportunities through strengthening collaborative research and its funding amongst interested countries. Jointly coordinated actions are funded by pooling of national resources. Finland is currently participating in the following nine of the ten European Joint Programming Initiatives (JPIs); of which the Academy of Finland is coordinating the Water JPI.

- Neurodegenerative Disease Research (JPND)
- Agriculture, food security and climate change (FACCE JPI)
- Healthy diet for a healthy life (JPI HDHL)
- More years, better lives (JPI MYBL)
- Connecting Climate Knowledge for Europe (JPI-Climate)
- Urban Europe: global changes – local solutions (JPI UE)
- Water challenges (Water JPI)
- Healthy and productive seas and oceans (JPI Oceans)
- Antimicrobials resistance (JPI-AMR)

Aside from European JPIs, the national research and innovation funding agencies have cooperation agreements with corresponding organisations in other countries: Tekes with Sweden, China, India, Russia and the US; the Academy of Finland with 16 countries. Moreover the funding agencies have launched focused initiatives to boost international cooperation. The funding criteria of Tekes and the Academy as well as HEI's institutional funding reward international cooperation. The Academy has earmarked funding for international projects whereas Tekes has not. The principle of Tekes has been that all the project applications compete against each other, and international projects have to succeed in this competition. However the funding criteria still reward for cooperative international projects.

Furthermore, R&I cooperation is intensive between Nordic countries. As an example Tekes co-funds innovation research with its Swedish sister organization VINNOVA under a joint programme.

According to statistics, the share of joint initiatives in Finland has been below the EU average. The latest available Eurostat data for Finland, however, shows an increase in the share of the public funding invested in transnational activities between 2010 and 2011: the amount of coordinated funding (which includes ESA contribution) more than doubled ([EU, JRC 2013, ERA Communication Synthesis report](#)).

The mandate for activating HEIs, PROs and enterprises to participate in international initiatives has been given to the funding agencies. Top-down joint calls and programmes are more common in scientific research but usually cooperative innovation is a bottom-up process that should not be dictated by external limitations.

Also the Finnish Strategic Centres for Science, Technology and Innovation (SHOKs) represent a kind of public-private joint programming approach led by the industry (see Chapter 1.2). The SHOKs have all a number of targeted collaborative research programmes including international cooperation. The mid-term evaluation of SHOKs in 2013 highlighted some programmes with very intense international collaboration.

In spring 2015, Team Finland launched its first cross-ministerial innovation programme, Business with Impact – BEAM. The programme is jointly funded by Tekes and Ministry for Foreign Affairs of Finland, with other Team Finland operators (such as Finnvera and Finpro) providing complementary services. With regard to the increasing the efficiency, performance and effectiveness of Team Finland, joint operations, such as common client process and coordinated evaluation system is being planned.

Finland is especially active in the Nordic research cooperation, now expanding to the Baltic States, and arctic research. Tekes is also involved in FIT (Finnish Israeli Technology), a joint programme between Finland and Israel for technology applications in different technology areas.

4.2.2 RI roadmaps and ESFRI

The first Finnish research infrastructure roadmap was published in 2009. A total of 24 major research infrastructure projects by national actors were selected for this roadmap. Of these, 13 formed part of European roadmap projects under the European Strategy Forum on Research Infrastructures (ESFRI). The 2009 roadmap and its recommendations resulted in a broader discussion of Finland's research infrastructures.

The Finnish Research Infrastructure Committee ([FIRI Committee](#)) was appointed in 2012 by the Academy of Finland. FIRI Committee is in charge of developing Finnish research infrastructures and decides annually the allocation (approximately €18.5m in 2015) of governmental investments into national and international research infrastructures.

The committee made also recommendations on how Finland's research infrastructure policy could be developed. Its key observations concerned the achievement of greater consensus and closer cooperation between ministries, funding agencies, universities and other research infrastructure host organisations, and the scientific community. Another important area of development was the opening up of national materials and registers for wider international use, for example, by stepping up the digitalisation of materials.

In March 2014, the FIRI Committee published Finland's national research infrastructure strategy as well as the infrastructure roadmap for the years of 2014–2020 ([FIRI Roadmap 2014-2017](#)). The roadmap is a plan for key research infrastructures in Finland that are either under development or that will be newly required over the next 10–15 years. The goal is to update the roadmap every five years. As regards the alignment of Finnish roadmap with the ESFRI process, the draft contribution is anticipated for spring 2016.

The FIRI research infrastructure strategy lays out a vision for Finland in 2020. By then, the strategy says, Finland will have gained further recognition for its world-class science and top-tier research, facilitating the regeneration of education, society and the business sector.

The FIRI strategy and roadmap do not automatically ensure financial commitments to research infrastructures, while some indication of the volume is given by the Academy of Finland's budget allocation for research infrastructures which in 2015 was €19.3m and included 48 investments along the lines of FIRI strategy¹⁰⁵.

In 2015, the Ministry of Education and Science commissioned a survey amongst Finnish research organisations reflecting the current situation of FIRI roadmap implementation. The study showed that the majority of higher education and research institutions incorporate research infrastructures in their organisational strategy or other programme. Higher education and research institutions also see the roadmap for national research infrastructures as an important tool in the development of the infrastructures. The goals of the roadmap, as regards developing research infrastructures, are also evident at the operational level. In most organisations, the focus points of research infrastructures are their profile fields. The national development needs are especially connected to supporting the open access and joint use of research infrastructures ([Strategic development of research infrastructures](#)).

Also included in the FIRI roadmap are significant international infrastructures such as CERN, the European Organisation for Nuclear Research, and BBMRI, the Biobanking and Biomolecular Resources Research Infrastructure, which are of key importance to Finnish research.

The roadmap includes a total of 31 research infrastructures as well as two projects with the potential to become significant infrastructures. Of the projects selected for the Finnish research infrastructure roadmap 2014–2020, 15 were also on the latest ESFRI roadmap, whereas 13 ESFRI projects appeared on Finland's national roadmap in 2009. The current projects fall under the following scientific fields:

- Social Sciences and humanities (7)
- Environmental Sciences (6)
- Energy (0)
- Biological and Medical sciences (10)
- Material Science and Analytics (3)
- Natural Sciences and Technology (4)
- e-Science and Mathematics (3)

The research infrastructures were selected in a two-stage international review using three main criteria: the project's significance to the Finnish scientific community as well as to the research strategy of the host organisations; the quality and scope of the potential user community; and the commitment by the participating organisations to the project. All of these criteria were interpreted from Finland's perspective.

The Finnish roadmap includes five sets of measures to realise the infrastructure strategy. These are:

1. Long-term development of all research infrastructures
2. Improvements of access to and collaborative use of research infrastructures
3. Shoring up of the funding base of research infrastructures
4. Provision of a firm basis, by the roadmap, for the methodical development of research infrastructures
5. Evaluation of the impact and significance of research infrastructures.

¹⁰⁵ Communication of the Academy of Finland, 16 January 2015.

In addition to ESFRI infrastructures, the FIRI Roadmap lists altogether 344 local research infrastructures, of which the majority are in universities (195) and in research institutes (107). Finland is also a member of 18 international research infrastructures, through various treaties and other agreements. In 2013, those membership fees totalled around €40m (see Table 3, in [FIRI Roadmap](#)).

4.3 International cooperation with third countries

According to the latest guidelines set by the research and innovation council (RIC) the priority countries for internationalisation of science and technology are the EU area, countries that have bilateral agreements with Finland, countries with FinNode cooperation (South Korea, Japan, China, Russia, United States) as well as emerging economies in Asia, the Americas and Africa, such as India, Vietnam, Bhutan, Brazil, Chile, Tanzania and South Africa.

According to ERA Survey 2014, the share of Finnish R&D budget allocated to collaboration programmes carried out with third countries was around 1.5 % of funders' budgets, which was below the EU average (2.4 %). Finland was also one of the Member States with no specific measure or strategy to this end ([ERA Progress Report 2014](#)).

Finnish funding agencies for research and innovation have established cooperation agreements with corresponding organisations in countries outside of the EU. For example, the Academy of Finland has bilateral agreements with 16 countries. Most of the agreements deal with mobility, while there are also joint research activities. The international strategy of the Academy of Finland states that the Academy will create strategic partnerships with foreign funding organisations to create opportunities for researchers to engage in joint projects, as well as enhance the impact of international activities in general. Tekes has established cooperation agreements with funding agencies in other countries, such as USA, Japan, China, Canada, Israel, Singapore and South Korea.

The Academy provides funding for international joint projects through various targeted calls, often as part of its research programmes or in the context of bilateral or multilateral agreements with China (Cas Fellowship to China), India, Japan (JSPS Fellowship to Japan) and Russia. The FinNode Centres (global network of Finnish innovation organisations operating via nodes in global innovation activity) in China, India, Japan, Russia and the USA are also valuable instruments for international cooperation. There are some field specific contracts also, e.g. Tekes cooperation with Canadian Institutes of Health Research (CIHR), but most instruments cover all areas.

Over the past decade or so, the Ministry for Foreign Affairs of Finland ([MFA](#)) has conducted with developing countries a number (12) of collaborative programmes that have focused on innovation system development at large. The latest ones include Vietnam-Finland Innovation Partnership Programme ([IPP](#)), the Information Society and ICT sector development project in Tanzania ([TANZICT](#)) and Southern Africa Innovation Support Programme ([SAIS](#)).

The establishment of Team Finland approach (Team Finland) has to some extent impact the coordination of international R&D cooperation. This is in particular relevant to Tekes, Finpro's and Ministry for Foreign Affairs of Finland's joint efforts for promoting international innovation activities of Finnish companies. For example, in 2015 Tekes and MFA launched a joint Team Finland BEAM – Business with Impact Programme ([BEAM](#)). The aim of BEAM is to assist Finnish enterprises and other actors in addressing global development challenges by converting such challenges into successful and sustainable business. The programme supports Finnish companies, NGOs, research organisations, universities, universities of applied sciences and others in developing, piloting and demonstrating innovations that improve wellbeing in poor countries, while giving rise to international business opportunities for Finnish companies. BEAM is a five-year programme with a total volume of €50m, about 50 % of which is financed by Tekes and the Ministry for Foreign Affairs.

The programme is not restricted to particular sectors, and the target countries can be any of the developing countries listed as eligible for official development assistance by the OECD/DAC (Development Assistance Committee), except China.

4.4 An open labour market for researchers.

4.4.1 Introduction

The main trend in this ERA priority in Finland is that institutional autonomy is common but funding incentives are used for facilitating researcher mobility. Many Universities (Including [University of Tampere](#), [University of Jyväskylä](#) and [University of Aalto](#)) have launched new tenure track systems and increased the recruitment of foreign researchers and professors recently.

Considering the statistics, in 2011 the number of researchers per 1,000 active labour force was 21.5 (EU average 10.6) and new doctoral graduates per thousand population aged 25–34 was 2.71 in 2012 (EU average 1.81). The share of non-EU doctorate students as a % of all doctorate students was 6.8 % in 2011 (EU average 24.2 %), which is alarmingly low ([EC 2014, Research and Innovation performance in Finland: Country Profile 2014](#) and [ERA Progress Report 2014, Country snapshots](#)).

Recent economic downturns and the structural reforms in HEIs have led to a growing number of highly educated people being unemployed. Considering different educational backgrounds, the proportion of the unemployment of the labour force aged 18 to 64 decreased in all categories until 2008. Unfortunately since 2012, the proportion of the unemployment has grown in all categories. According to [Statistics Finland](#), however, the highly educated have been most affected. The proportion of the unemployed among the labour force grew for all levels of education. The number of the unemployed grew most among highly educated people; for persons with lowest level tertiary qualifications or lower university degrees, unemployment increased by 29 %, and for persons with higher university or doctorate level degrees, by 31 % compared to 2012. Many universities and PROs have been forced to lay off staff due to the decreased public and private funding. Some unemployed academics establish companies of their own; others re-educate themselves to better fit new prospects in the job market. Despite this, there is a need to attract more qualified researchers and labour in order to support and sustain the relatively high level of the Finnish research and innovation system. While the amount of researchers has decreased since 2008, the decrease has not been reflected neither in the share of foreign researchers or in the mobility of students and staff at Finnish HEIs. Both of the latter values have actually increased ([Finnish National Board of Education \(FNBE\), Statistical services](#), in Finnish). Speaking of employment and labour force, in 2010–2013 altogether 1,219 new professors were recruited to Finnish universities and research institutes. 166 (14 %) of them were foreigners ([Academy of Finland, The State of Scientific Research 2014](#), in Finnish). The share of foreigners among young researchers is higher than in other groups. Overall statistics is not available but for example at the biggest Finnish university (Helsinki University) the share of foreigners among young researchers is about 30 % while the average is about 8 %. This is a promising sign considering the low numbers otherwise.

One of the specific challenges related to the mobility of researcher and the deepening of research collaboration between universities and other research institutions has been the career aspects of researchers. In this regard, in June 2014 the Ministry of Education and Culture assigned a working group for the development of research careers in universities, universities of applied sciences and in research institutions, with a deadline of February 2016 for reporting.

Overall the deepening of the collaboration between universities and research institutions is a complex issue and a long-term development process has been initiated to that end (KOTUMO).

The main objective of the KOTUMO Roadmap for 2015 to 2017 is to create the best possible conditions for enhancing quality in research and innovations activities in Finland and to make the Finnish science community more visible internationally and strengthen its scientific impact by bringing together resources, stepping up cooperation and improving the division of labour. The roadmap gives a vision for collaboration for 2020 and lists key measures for reaching this vision. They encompass 1) steering and communication, 2) collaboration in education and research between higher education institutions and research institutes, 3) joint field stations and campuses, 4) common infrastructures in education and research and 5) more open and shared data repositories and research results.

4.4.2 Open, transparent and merit-based recruitment of researchers

High institutional autonomy affects recruitment and awarding positions of trust in Finland. The Strategy for the Internationalisation of Higher Education Institutions in Finland (2009–2015) calls for the principles of open, transparent and merit-based recruitment as laid down in the Charter and Code. UNIFI (the Rectors' Council of the Finnish universities) and the Academy of Finland have signed up to the Charter and Code. The principles are being promoted through national higher education and research policy. Moreover, the funding models of HEIs, the 2012 agreement between national authorities and HEIs, and the new tenure track system adopted by the universities since 2010 support the principles of prioritising and focusing on improving research careers. A governmental programme was launched in 2007 to ensure that recruitment policies are developed in a way that makes research careers, both studying and working in Finnish universities and research institutes, more attractive. Moreover, measures such as RIC recommendations 2015–2020 and the FiDiPro programme further contribute to the opening up of the recruitment system and attracting foreign researchers.

The Finnish universities are fully autonomous under the Act on Universities (2010) and thus MEC cannot directly affect recruiting or the nature of the contracts of the academic personnel.

All Finnish universities post their open vacancies online although platforms may however vary between universities. Most institutions have a policy of publishing job vacancies also on relevant Europe-wide online platforms, including EURAXESS. Although, as discussed before, the institutions are highly independent, the practices in recruiting are quite similar. There are only some variations in details between individual institutions but the main principles are the same. This is elaborated below, considering the case of the biggest Finnish university, University of Helsinki. An open vacancy announcement is in use everywhere, but there may be exceptions for special reasons. Teaching and research positions are normally opened also for international applications.

Let us now consider the recruiting practices of University of Helsinki. The vacancy announcement always includes the job profile, skills and competences required, the eligibility criteria and the information about the selection process. The criteria used in evaluating the candidates are available for the candidates. The time period between publishing the open vacancy and deadline for application is defined but not included in the announcement - the information can be obtained by asking. Those applicants who have been selected on the short list of best applicants are able to get feedback from the assessors. Some special reasons –like gender equality– give a right to appeal against the decision. Considering professorship, an appointment committee is established to prepare for the appointment process of a professorship, and information on the composition of the appointment committee is available for candidates. Selection committees are indeed the general rule here, although there may be exceptions and variations. Universities have instructions and guidelines for the composition of selection committees especially for tenure track recruitment. However, some guidelines are more generally valid for all academic recruitment. The composition of the selection committee is public information. The members of the selection committee are professionals from Finland (internal and/or external) but the assessors are international.

The procedure varies depending on the level of the title (a four-level hierarchy for teaching and research staff is commonly used). In 2012, 56 % of university-based researchers were satisfied with the extent to which research job vacancies are publicly advertised and made known by their institution ([EC, MORE2, 2013](#)).

The share of researchers (post PhD) having spent a period of at least 3 months as researchers in another country was 57 % (EU average 48 %, 2012), the share of non-EU doctoral students was 6.8 % (EU average 24.2 % in 2011), doctoral candidates with a citizenship of another EU member state was 7 % (EU average 8 % in 2011), work or internship in the non-academic sector during PhD was 26 % (EU average 23 % in 2012), and post PhD researchers with inter-sectorial mobility was 12 % (EU average 12 %). As a summary it can be stated that the outward flow of researchers is a bit above the EU average, the inward flow is clearly below the EU average. Most of the foreign researchers come from the EU countries, and the inter-sectorial mobility is about at the average level of the EU countries ([EC, The Researchers' Report 2014](#)). The international mobility of the Finnish education and research labour increased by 19 % in 2010–2013 ([FNBE, Statistical services](#)).

It has been noted that a particular challenge for Finland in its efforts to attract foreign talents relates to the research and innovation environments and the non-competitive salary in the public and higher education sectors (Viljamaa et al., 2010). The situation might, however, have changed since 2010. Today, there are no legal limits for researcher salary. The salary, however, must be in a reasonable balance with salaries paid for Finnish researchers. According to an interview among university managers, there have been very few cases when the salary has been a deal breaker for recruitment. A researcher career is still quite attractive in Finland although the salaries are not high - they are a bit above the EU average - and the researcher labour market is strongly competitive. About one third of the contracts are permanent. The labour market has been quite unstable for the younger generations but the tenure track system adopted by the universities in 2010 now provides better opportunities for career development.

International evaluations and audits of staffing policies have been done in many universities but they have been for internal use only. Higher education and research institutes are autonomous to organise their activities in the areas of education, research and innovation, and according to the State of Scientific Research (2014) no alternative sources of funding for HR purposes are needed. There are no national accreditation mechanisms, institutional processes or informal barriers that hinder foreign researchers' access to the scientific labour market. However, in some cases the Finnish language is essential which may discourage the access.

4.4.3 Access to and portability of grants

Grants are by and large open to foreign researchers and portable to other EU countries (e.g. Academy of Finland grants and fellowships), and the Academy of Finland has signed up to the Money Follows Researcher (MFR) agreement, the initiative of the European Heads of Research Councils (EUROHORCs). The Academy of Finland is committed to promote the internationalisation of Finnish science and research by establishing bilateral agreements with countries and regions. For instance, the Academy of Finland provides funding for the Finnish Centres for Excellences (CoE) in order to support international cooperation in research. Financing to support the outflow of researchers is provided especially by the Academy of Finland and Tekes. Publicly funded grants or fellowships by the Academy of Finland are portable to other EU countries. However, administrative processes involved remain problematic, thus discouraging researchers from going abroad.

In case of Tekes, international researcher mobility involves performing part of the research work for the project in Finland and part of it abroad. Alternatively, a researcher can come from abroad to work in a research project carried out in Finland. Researcher mobility funded by Tekes involves research that genuinely adds value to the project. Tekes covers costs incurred by the recipient from researcher mobility. Tekes only provides funding for researcher mobility to the results for which the recipient receives at least access and utilisation rights for research and education purposes free of charge and globally ([Tekes, General terms and conditions 2012, Funding for Public Research](#)).

The FiDiPro programme of the Academy of Finland and Tekes is one of the tools established in Finland to tackle the issue of attracting talent from abroad. Additionally Joint Degree Programmes have been initiated in Finnish universities to target foreign students aiming at Master's Degree level. Moreover, especially Tekes and the Academy of Finland promote the use of EU mobility schemes. So far the actions taken have improved the situation very slowly. To summarise, other policies or measures could perhaps be developed, as Finland is not considered a hotspot of scientific research and is unsuccessful in attracting foreign researchers on a larger scale.

Student allowances are partly restricted for Finnish students residing temporarily abroad and foreign students having "permission for municipality of residence" in Finland. A bill is ongoing in the Parliament to make the rules less restricted (Proposal of the government 6 October 2015)¹⁰⁶.

4.4.4 Doctoral training

The 'National Guidelines for the Development of Doctoral Training' (2011) outlines the principles for doctoral training in universities. In the guidelines, the annual goal for new doctors graduated for the period of 2011–2016, is set to 1,600 per year. At the same time, the overall emphasis was moved from doctoral education more towards post-doctoral career development.

Until 2010, the Academy of Finland evaluated the applications of graduate schools for doctoral studies. The funding was part of the basic funding for universities through the Ministry of Education. All responsibilities regarding graduate schools have then been transferred to the universities. Since 2011, all Finnish universities have started the reform of the doctoral training system in line with the principles of innovative doctoral training. The Strategy for the Internationalisation of Higher Education Institutions in Finland (2009–2015) aims at improving the entry of foreign researchers and their access to research positions in Finland. Today, the doctoral trainings are primarily organised as full-time, four-year training periods and the training programmes form an integral part of universities research strategy. It is the task of the universities to gather doctoral training programmes into larger units for increasing their efficiency and quality.

At least some elements of IDT (Innovative Doctoral Training) are indeed fulfilled in projects funded by Tekes. Tekes does not fund individuals such as researcher. It instead funds research projects, although in the evaluation of the project applications also the skills and expertise of the applying researcher are considered. A significant number of academic degrees are achieved as a result of projects funded by Tekes. For example, 840 students graduated through the projects that ended in 2013, and 1,030 patents or patent applications were filed, as well as 1,270 new products, services or processes launched.

¹⁰⁶ https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE_40+2015.aspx

4.4.5 Gender equality and gender mainstreaming in research

In addition to the Equality Act, which supports gender equality in HEIs and PROs, Finland has also adopted measures to support gender equality when decisions on research positions and research funding are made (government Action Plan for Gender Equality (2012–2015) and Academy of Finland's criteria for research funding decisions). As part of the steering of HEIs process and the 2012 agreement between national authorities and HEIs, the latter are required to report on the implementation of their gender equality strategies.

According to a study made in 2009, the government programmes and the government Action Plans for Gender Equality have incorporated ambitious objectives for the promotion of gender equality in higher education and in the field of science. During the period of review the objectives included dismantling segregation, reinforcing gender sensitivity in teacher education, promoting women's research careers, and establishing the status of female students. Based on the results of the study, university and science policy had included relatively few concrete measures that enable the integration of gender equality into all actions regarding higher education and science.

The Gender equality index for Finland was 73.4 (EU27 54.0), and part index for knowledge 67.0 (EU27 48.9) of the European Institute for Gender Equality (Gender Equality Index Report 2013)¹⁰⁷. The Guardian Gender Equality Report ranks Finland 2nd in the Global Gender Gap Index¹⁰⁸. The female to male ratio in tertiary educational attainment was 1.21, and in professional and technical workers 1.08 in 2014. ERA Snapshot Finland¹⁰⁹ and OECD.Stat¹¹⁰ gives the following figures for gender equality:

- share of female researchers (2013) 32.5 %, EU 33.2 %
- share of female PhD graduates (2012) 50.9 %, EU 47 %
- share of female senior researchers (2010 or latest available data) 24 %, EU27 20 %
- proportion of female heads of institutions in HES (2010) 25.0 %, EU28 15.5 %

The long-standing gender equality work of the Academy of Finland has served as an example of how gender equality issues can be successfully integrated into activities. In 2011, more than 50 % of the public sector research and development personnel were women (Academy of Finland, 2012).

4.5 Optimal circulation and Open Access to scientific knowledge

Led by the Ministry of Finance, the [Open Data Programme 2013–2015](#) has been put forward, aiming at eliminating obstacles in the re-use of public data and creating the preconditions for making public administration data open. Ministries, government agencies, municipalities, enterprises, NGOs, various organisations developing the sector and citizen bodies are collaborating in the implementation of the programme.

In 2014, the MEC launched an [Open science and research roadmap 2014–2017](#). It is based on the work of the Open Science and Research Initiative (ATT), a cross-administrative initiative established by the Ministry of Education and Culture, with the goal of promoting open science and the availability of information. Open science means the promotion of an open operating model in scientific research. The key objective is, subject to the restrictions of research ethics and the juridical environment, to publish research results, research data and the methods used, so that they can be examined and used by any interested party.

¹⁰⁷ <http://eige.europa.eu/apps/gei/content/Gender-Equality-Index-Country-Profiles.pdf>

¹⁰⁸ <http://www.theguardian.com/news/datablog/2014/oct/28/not-one-country-has-fully-closed-gender-gap-yet-report-shows>

¹⁰⁹ http://ec.europa.eu/research/era/pdf/era_progress_report2014/era_snapshots_2014.pdf#page=34

¹¹⁰ http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB

Open science includes practices such as promoting open access publishing, openly publishing research materials, harnessing open-source software and open standards, and the public documentation of the research process through 'memoing'.

4.5.1 e-Infrastructures and researchers electronic identity

The e-science research infrastructures identified in the FIRI Committee's Roadmap include a range of services and supercomputers for use in computation and the management and archival of generated data, as well as open access to research results. Two major research infrastructures CSC and PRACE, were selected for the e-science (and mathematic) roadmap. The latter one is also on the ESFRI roadmap.

CSC - IT Centre for Science Ltd ([CSC IT](#)) is a state-owned non-profit limited company administered by the Ministry of Education, Science and Culture. It provides ICT services for the Finnish scientific community. It is one of Northern Europe's largest super computing centres. CSC is a member in major European research e-infrastructures and a partner in several ESFRI projects. It has an important role in horizontal e-infrastructures that integrate scientific disciplines and organisations across the Europe.

Partnership for Advanced Computing in Europe - PRACE (Finland) is a European research infrastructure offering high-performance computing resources ([PRACE](#)). The PRACE research infrastructure consists of national European computing centres functioning in collaboration with one another. It has 25 member countries from EU member states and collaborating countries. PRACE offers computing time on six Tier-0 and several Tier-1 national supercomputers. Its Tier-0 supercomputers are located in Germany, France, Italy and Spain. Finnish CSC has a Tier-1 supercomputer in PRACE, located in Kajaani.

No overarching policy on electronic identity for researchers in Finland has been identified, although electronic identity is being implemented. Finland participates in the following initiatives related to e-identity: GEANT and EduROAM (through [Nordunet](#) gathering Nordic regions), REFEDS (Research and Education Federations) and EDUGAIN through Haka. It is the identity federation for the Finnish higher-education and research institutions serving as a route to more than 160 services. It has 298,000 end users, which also is the total number of university and polytechnic students in Finland. Users log into Haka services over 11 million times per year. Haka is connected to the other identity federations of the Nordic higher-education institutions, giving users access to services throughout the Nordic region. FUNET is the Finnish National Research and Education Network (NREN), a specialised Internet service provider dedicated to supporting the needs of the research and education communities within the country. HAKA and FUNET are hosted by [CSC](#) that provides a computing environment and virtual computation services for R&D. Researchers can access the services through the FUNET network. Examples of the services that are available to researchers are:

Funet Network Services

- [Eduroam Roaming Access Service](#)
- [Funet Boksi Cloud Storage Service](#)
- [Funet FileSender File Sharing Service](#)
- [Funet Tiimi Web Conferencing System](#)

Identity and Access Management

- [Haka Identity Federation](#)
- [Resource Entitlement Management System \(REMS\)](#)

[Consultation and Tailored Solutions](#)

[Training Services](#)

Education Management and Student Administration Services

- Eduuni - e-Work and Collaboration Service Environment

Scientific Computing and Software

Research Information Management

- AVAA - Open-access publishing platform
- Etsin - research data finder
- IDA Storage Service
- Research Information Management

4.5.2 Open Access to publications and data

Although Open Access-related measures have been adopted as early as 2005, there is no overall legislation supporting Open Access to research publications and data. A national policy for the long-term storage of data is a broader initiative in Finland. The government Programme specifies that "opening the non-sensitive public databases will boost open science and create opportunities for new entrepreneurship and service innovations". Government's objectives are implemented by the National Research Data Project (TTA). The first institute to open public databases was the National Land Survey of Finland ([NLS](#)). Open spatial data sets and interface services are available in Finland now free of charge. Coming back to the TTA project, it also includes measures like the Open Data Programme and the Working group on Open Access to publications and research data. Finland has adopted two overarching policy measures supporting the development of digital research services (i.e. 'Putting data into use' and 'Roadmap for the utilisation of electronic data in research')

The Ministry of Education and Culture of Finland has launched the Open Science and Research Initiative (ATT) for the promotion of research information availability and open science platform for the years 2014-2017.¹¹¹ In 2014, the MEC released The Open Science and Research Roadmap 2014-2017. Finland's vision for 2017 is: "Open research leads to surprising discoveries and creative insights. This means a situation in which research data and materials move freely throughout society; from one researcher or research team to another, between disciplines, to innovative businesses, and to decision-makers and citizens. Information flow is facilitated by clear policies and best practices, and by providing services to safeguard the availability of scientific and research results. Openness is a joint operating model. Openness has given Finnish research an international competitive edge."

Open Access is not a mandatory funding criterion within the Academy of Finland funding programmes but the Academy recommends that Academy-funded researchers and research projects deposit their research data in open-access repositories, and that Academy-funded researchers investigate the possibility of long-term storage of their data. Recommendation is that research data is stored and made available through major national or international repositories, such as:

- Finnish Social Science Data Archive (FSD)
- FIN-CLARIN consortium
- CSC's IDA Storage Service and its Kata metadata catalogue and AVAA open-access publishing platform
- CERN's Zenodo service

¹¹¹ <http://openscience.fi/>

The data should be delivered and deposited as soon as possible after Academy funding has ended. As for publishing, the Academy advises that researchers deposit their articles and other publications (as well as parallel copies) in high-quality open-access publication repositories, either provided or recommended by the host organisation. The Academy does not recommend so-called hybrid forms of open-access publishing.

The proportion of OA articles in Finland 2008–2013 was 55 % (adjusted 63 %), (Green 8.9 %, Gold 9.3 %, other 38 %); the total EU proportion was 51 %, (http://www.science-metrix.com/pdf/SM_EC_OA_Availability_2004-2011.pdf Proportion of Open Access Papers, Science Metrix 2014).

5. Framework conditions for R&I and Science-Business cooperation

5.1 General policy environment for business

According to the World Bank “Doing business index”, there is a favourable environment for business in Finland. The overall ranking of Finland in 2015 was 9th (8th in 2014), the third highest of European Countries after Denmark (4th), Norway (6th) and United Kingdom (8th). Finland ranked among the top 20 countries in *Resolving Insolvency* (time and cost to resolve bankruptcies, ranking 1st), *Trading Across Borders* (the costs and procedures involved in importing and exporting, 14th) and *Enforcing Contracts* (the ease or difficulty in enforcing commercial contracts, 17th) indexes. The lowest scores Finland received in *Protecting Minority Investors* index (ranking 76th), the sixth lowest of all OECD high-income countries. In other areas Finland ranked between 21st and 38th ([Doing business 2015](#)).

Regarding the insolvency resolving indicator, Finland stand out especially in the average duration and costs of bankruptcy proceedings and recovery rate (how many cents on the dollar secured creditors recover from an insolvent firm). The average duration of bankruptcy proceedings in Finland was 0.9 years, compared to OECD average of 1.7 years. The average costs were 3.5 % of estate’s value (OECD average 8.8 %). Recovery rate in Finland was 90.2 %, compared to OECD average of 71.9 % ([Doing business 2015](#)).

Finland ranks high also on WEF Global Competitiveness Index (GCI) (overall ranking 8th in 2015), although dropping four places from previous year. In 2015, Finland was among the top 5 performers in institutions (1st), health and primary education (1st), innovation (2nd), higher education and training (2nd). Lowest scores Finland received in market size (59th), macroeconomic environment (36th), labour market efficiency (26th) and – perhaps surprisingly – infrastructure (25th) ([WEF 2015](#)).

According to IMD (International Institute for Management Development) Competitiveness Scorecard, Finland is among the five most competitive countries in areas of education, societal framework, health and environment, management practices and business legislation, but falls behind in factors related to labour markets, fiscal policy, employment, international investment and trade as well as domestic economy, prices and public finance ([IMD 2015](#)).

5.2 Young innovative companies and start-ups

Supporting the business environment of start-ups and young innovative companies (YIC) (or high-growth-firms (HGFs)) is a top priority in the Finnish research and innovation policy. The policy makers are aware of the economic importance of new start-ups and YICs in creating new jobs, growth as well as other positive effects to the economy. Enhancing this kind of dynamism and structural change is seen vital in Finland, where traditionally, few strong sectors and large companies have dominated.

The importance of developing policies for YICs and start-ups is stated in the Research and Innovation Council guidelines for 2015–2018. The report highlights the need to strengthen the equity market for start-ups and growth enterprises by targeting public funding at start-up phase companies facing the greatest risks. In addition, the report highlights the need to encourage private investors, funds and financial institutions to target more funding at early-phase companies as well as strengthening non-conventional funding alternatives (e.g. crowdfunding, intermediate phase funding) ([RIC, Reformativ Finland 2014](#)).

Tekes is the main public actor for YICs and growth-oriented start-ups. Already in 2006 it was decided that Tekes should have stronger impact on generating new start-ups, growth companies and new business lines in existing companies. The Young Innovative Companies (YIC) programme was launched in 2008. It is the main funding instrument for YICs in Finland. By providing funding up to €1.25m (covering up to 75 % of the total costs), YIC aims to substantially accelerate the global growth of the most promising small companies. The programme is very selective and designed for companies that aim for international ambitious growth and that have been in operation less than 6 years and have proven its business concept. Funding is provided in three phases (€250,000 grants + €250,000 grants + €750,000 loans), each dependent on the achievement of specific milestones. By 2015, a total of 260 companies have been selected to the programme and 75 companies have completed all three funding phases ([Tekes YIC](#)). According to external evaluations, the results of the programme have been very promising. A key feature of the programme is its comprehensive approach for the company development: besides funding, the programme helps companies by providing non-financial support (e.g. mentoring) ([Assessment of YIC](#)).

In 2013 Tekes introduced a "Planning for Global Growth" instrument (KKS) with the purpose of helping companies examine their readiness for achieving rapid international growth. The maximum funding for companies less than 5 years old is €50,000 and for other growth-oriented companies €100,000. The funding must comply with the EU de minimis regulation ([Tekes KKS](#)).

Another important instrument for YICs is VIGO business accelerator programme, established in 2009. The purpose of VIGO is to bridge the gap between early stage technology firms and international venture funding by combining public and private funding. By 2014 the share of public funding was around 26 % of the total funding. The programme is implemented through independently run companies (currently 9), who act as "co-entrepreneurs" and invest in the companies they work with. Tekes is responsible for the implementation of the programme and it is coordinated by an independent contractor ([VIGO](#)). According to an external mid-term evaluation, VIGO has been successful in achieving its early-stage goals ([Mid-term evaluation of VIGO](#)). Science|Business Innovation Board assessment of the YIC and VIGO programmes uncovered good evidence on their success (The impact of high-growth entrepreneurship policy in Finland)¹¹².

Tekes Venture Capital Ltd (established in July 2014) invests in VC funds which invest in early stage Finnish companies. The purpose is to develop Finland's VC market by "fixing shortcomings that exist in the availability of funding for the initial stages of the operations of a company". In the new government Programme additional funds of €10m will be allocated to Tekes Venture Capital Ltd ([Tekes VC](#)).

The Team Finland LetsGrow Financing Programme combines advisory services for internationalisation (Finpro), grants (Tekes) and loan financing (Finnvera). The programme is open to internationally growing SMEs with a stable financial standing and a turnover of some €5–50m. Thus, although the programme manifests the focus on internationally oriented growth companies, it should not be considered an instrument especially for start-ups ([TF Letsgrow](#)).

Other instruments, not considered especially for start-ups but having a clear impact on the birth of new start-ups, has been established due to Nokia's subsequent restructuring. For example, within Nokia's new career support programme (the Bridge Programme) some 400 new firms were founded between 2011 and 2013, many of which classify as new innovative firms. Microsoft will continue with its own career support programme Polku.

¹¹² <http://www.sciencebusiness.net/OurReports/ReportDetail.aspx?ReportId=84>

In parallel with public policy attraction to start-ups, there have been significant grassroots level initiatives to bolster start-ups. Although similar initiatives have emerged in many cities (see for example [BusinessOulu](#)), the most recognised initiatives are arguably those emerging around the Aalto University, e.g. the Start-up Sauna accelerator and especially SLUSH start-up event, which attracts more than 10,000 attendees (start-ups, international investors, executives and media) from all over the world. These initiatives have also received some public support, but they should be seen first and foremost as bottom-up initiatives. Yet, the government is looking for new means to facilitate this type entrepreneurial ecosystem development. ([Startupsauna](#), [SLUSH](#))

Despite introducing significant cuts to public R&D expenses, the new government Programme aims to enhance the funding, equity capital and risk-taking capacity of start-ups and YICs. The cuts to Tekes' budget are likely to harden the funding for large businesses and research organisations as the needs of young companies and SMEs will be prioritised. Combined with the additional investments to Tekes Venture Capital Ltd, it is evident that the focus of the Finnish R&D system will take a further shift towards start-ups and YICs in the coming years.

5.3 Entrepreneurship skills and STEM policy

Strong human resource base is one of the core strengths of Finland. The very high quality of primary education (ranked 1st in WEF Global Competitiveness Index in 2015) provides a strong foundation. Also the higher education system in general (4th) as well as the quality of math and science education (2nd) has been ranked very high by WEF. Finland has also been very successful in PISA rankings. In 2012 Finland was the second best OECD country in scientific literacy, third best in reading literacy and sixth best in mathematical literacy. However, despite still being one of the best countries, especially the drop from 1st place in 2003 to 6th place in 2012 in mathematical literacy spurred wide public discussion on the quality of Finnish education ([PISA](#), [WEF 2015](#)).

According to OECD STI Scoreboard, human resources in science and technology (HRST) play a key role in innovation. The share of professionals and technicians of total employment is relatively high (over 40 %) in Finland compared to OECD average (around 30 %). However, for example in Sweden, Denmark, Norway and US the share of HRST is higher than in Finland ([OECD STI Scoreboard 2013](#)).

As for the entrepreneurship education, Finland is one of the few countries who have published guidelines for entrepreneurship education. The guidelines, published in 2009, highlighted the importance of entrepreneurship education and identified priorities for each education level. For higher education the priority areas included the developing qualification system for entrepreneurs, developing apprenticeship training in entrepreneurship, enhancing SME personnel's competencies and promoting regional cooperation between different stakeholders. In 2009, the ministry also published a specific study on the topic. The report proposed several recommendations on promoting entrepreneurship in higher education. More recently, the Education and Research action plan for 2011–2016 stated that entrepreneurship education should be strengthened at all education levels. The new government programme introduced significant cuts to education budget. It is not yet clear how these cuts will affect the entrepreneurship or STEM education ([MEC 2009](#)) ([MEC 2009b](#)).

Although entrepreneurship is an important cross-cutting theme in the Finnish government Programme, it does not include any specific national level actions for the development of entrepreneurship education. However, there are several grassroot-level initiatives to promote entrepreneurship in education. Some of them are mentioned here:

- The LUMA Centre promotes science and mathematics studies. It is a national network of different LUMA Centres at universities around Finland. It aims to ensure high level of scientific literacy and knowledge of STEM and sufficient number of skilled experts in the STEM fields ([LUMA Center](#)).
- Junior Achievement Finland and YES. JA Finland aims to advance entrepreneurial attitudes and increase knowledge of entrepreneurship through schools, universities and other educational institutions. YES is an entrepreneurship education service for teachers, provides training in entrepreneurship education and services for developing entrepreneurship in schools and establishing school-business networks. It is also responsible for JA Finland's regional services ([JA Finland](#)) ([YES](#)).
- Startup Life is a non-profit internship programme for students with entrepreneurial aspirations. It offers students an opportunity to work with start-ups in Silicon Valley. It is run by Aalto University and Startup Sauna ([StartupLife](#)).
- Federation of Finnish Entrepreneurs, together with universities and other stakeholders, has conducted various other individual initiatives and concepts for promoting entrepreneurship in education organizations.

In the latest WEF Global Competitiveness Index Finland ranks 10th in Extent of staff training and 4th specialized training services ([WEF 2015](#)).

5.4 Access to finance

According to the Annual Report on European SMEs 2013/2014¹¹³ 15 % of SMEs see access to finance as the most pressing problem in 2013. The questionnaire¹¹⁴ of the Confederation of Finnish Industries (July 2015) indicates that 7 % of SMEs in Finland have had remarkable difficulties in access to finance. The Conjecture barometer (August 2015)¹¹⁵ indicates that only 6 % of industrial SMEs and 2 % of service sector SMEs have difficulties in access to finance. These figures may not be exactly comparable to the figures of the European SME report but may indicate that access to finance is not a major problem in Finland in general. On the other hand RIC states that the lack of Finnish capital is a challenge to the funding of start-ups and growing enterprises. Limited risk-taking ability of investors, requirements of high return on invested capital, and the division of capital into a number of small investments are seen as restrictions to the availability of funding. Thus, access to finance is especially a challenge for internationalising growth companies which also are crucial for renewing the structure of the national economy and increasing productivity through reallocation of resources (creative destruction). That's why the priorities of the Finnish innovation policy have changed more towards start-ups, growth companies and commercialisation of research. The government has allocated more capital to FII (Finnish Industry Investment Ltd), and increased and enlarged Finnvera's financing mandate and its risk taking.

Venture capital and business angel networks

Looking at the FVCA's (Finnish Private Equity and Venture Capital Association) VC market statistics of the PE industry, VC investments in Finland were 0.06 % (as a % of GDP, 2014) which is the second highest value among European countries (FVCA, VC/PE Industry in Finland 2014)¹¹⁶. All PE investments were 0.35 % of GDP, a bit more than the EU average (0.28 % of GDP).

¹¹³ http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/files/supporting-documents/2014/annual-report-smes-2014_en.pdf

¹¹⁴ http://ek.fi/wp-content/uploads/PKYritysten_toimintaymparisto_kesakuu2015.pdf

¹¹⁵ <http://ek.fi/wp-content/uploads/SB-elo2015.pdf>

¹¹⁶ http://www.fvca.fi/files/920/Pa_a_omasijoittaminen_Suomessa_2014.pdf

VC investments are often syndicated or they are dependent on other risk taking funds. FVCA listed all early stage investments and Tekes' funding for Finnish young growth companies in 2014:

PE (seed, start-up, later stage venture), includes international investments	€124m
BA (members of FIBAN who answered the survey)	€33m
Other VC (BA and public; estimate)	€11m
Tekes YIC funding, directly or through VIGOs	€28m
Tekes R&D grants for young (less than 6-years old) enterprises	€32m
Tekes R&D loans for young (less than 6-years old) enterprises	€71m
Total	€299m

According to the IU progress report at country level (key indicators) in 2012 total invested venture capital in Finland was 0.24 % (as a % GDP), whereas the EU average was 0.29 %. Thus, it seems that venture capital under management in Finland is below the EU average but yearly VC investments are comparatively high. In connection with VC investments, it is beneficial to consider the functionality of start-up ecosystem as a whole. Regarding the start-up ecosystem, it seems to work well thanks to a good cooperation between all actors in the ecosystem (see Chapter 5.2). However, it is difficult to say if the situation is a longer term trend or just a momentary improvement. The consensus in Finland at the moment seems to be that the major challenges are more related to the later stage PE investments.

Finland has had co-investments programmes in place for many years. The government has long been a player in the seed and early-stage market through Sitra, the Finnish Innovation Fund. *Veraventure Ltd* was established in 2003 as a venture capital investment company serving as the hub for public early-stage venture capital investment. In addition to Finnvera's seed fund, Vera, the government has established a new 45M EUR fund focused on the commercialisation of innovations. Unlike previous schemes, the government only invests in companies if the private sector invests, therefore investment decisions are made mostly by the market and private sector.

5.5 R&D related FDI

According to Statistics Finland, at the end of 2013 the value of foreign direct investments (FDI) to Finland totalled €63.2b. Direct investments were made particularly from Sweden (52 %), the Netherlands (16 %) and Denmark (7 %). Investments to Finland focused mainly on financing and insurance activities and the industry of other services.

Lately Invest in Finland (as part of the Team Finland) has started to keep more detailed records of corporate investments in Finland. According to them, in 2014 the FDI increased slightly. During that year, 229 new foreign owned companies were registered in Finland during 2014 (213 previous year). Most of them came from Sweden, UK and USA. The investments made focused on the ICT sector, business services, healthcare, retail and environmental technologies. The availability of a competent work force is one of the key factors influencing investment decisions. The structural reforms in the Finnish ICT sector have increased the availability of skilled workforce and attracted foreign companies to locate, with significant investments. Most potential investment areas in Finnish ICT are for example, vehicles, smart traffic, health, gaming industry, wireless technologies, industrial internet and cyber security ([Finpro, 11.3.2015](#)).

It is however difficult to define and measure which part of the FDI is actually targeted to research and innovation activities. Intramural R&D expenditures of multinational corporations and international VC investments may however indicate it. They were €562m in 2011 (11% of BERD), ([OECD: AMNE Database – Activity of Multinational Enterprises](#)). This data does not match well with the national statistics according to which foreign R&D funding of enterprises was €251m in 2011. The mismatch reflects the challenges in collecting this kind of data. On the other hand foreign R&D funding of enterprises according to the national statistics, was €539m in 2013 which is close to the AMNE Database data. The intramural R&D expenditures of multinational corporations indicate mainly the foreign affiliates' share of overall entrepreneurial activity in a country. In Finland the share (of turnover) has been quite low varying between 17 % and 22 % and being 18 % in 2013 ([Statistics Finland 2014, Foreign affiliates in Finland](#)). Also according to OECD statistics, the R&D expenditure performed by foreign-controlled affiliates in 2009 was only 14.5 % - much less than in e.g. Canada (35.4 %), Norway (30.5 %), Netherlands (30.2 %), Sweden (29.6 %) or Germany (27.3 %) ([OECD Science, Technology and Industry Scoreboard 2013](#)).

Inward FDI stock as a % of GDP was in 2012 in Finland 38.1 % (EU28 average 30.1 %). International VC investments (institutional, private) can be estimated from the data of the FVCA (Finnish Venture Capital Association). Foreign VC/PE investments in 2014 were €50m, 0.025% of GDP¹¹⁷.

5.6 Knowledge markets

The [Finnish Patent and Registration Office](#) (PRH) is the organisation responsible for services connected with protecting IPR in Finland. Centres for Economic Development, Transport and the Environment (ELY centres) are the regional providers of IPR related services. PRH and ELY centres promote innovation and the technical and commercial exploitation of inventions related to IPRs. They assist inventors in questions related to patenting and other industrial property issues, product development and funding applications. PRH and ELY centres participate in conferences, seminars, trade shows and fairs introducing their services and providing IPR related information. The ELY innovation advisors are contact persons for the [Product Track service](#). Nationally, the applications for first stage development aid for inventions can be submitted to the Product Track service at the ELY Centre in Helsinki. The funding is primarily intended for microenterprises that want to develop their innovative ideas and inventions into business. The grant paid to companies for these invention development projects accounts for maximum of 50% of the approved costs. The aid granted is subject to de Minimis conditions.

Tekes funding for enterprises allows the services purchased externally for the acquisition of IPR to be included on the eligible costs for SMEs. In Tekes funding for research organisation ([Tekes, General Terms and Conditions for Public Research Funding](#)) the public availability of project results and the rights to the commercial use of project results are defined. This practice normally leads to companies and research organisations agreeing separately how the IPR is shared before project starts. A model agreement of Tekes can be used. Support for the commercial exploitation is related to the internationalisation (see Chapter 4.2). The statistics of the public funding to support IPR and commercial exploitation is not collected in Finland.

The number of national patent applications has been decreasing for several years but the number of international applications has increased until 2008 and after that remained about at the same level. This indicates the importance of global markets for a small economy such as Finland. The ratio of PCT patent applications per billion GDP (in current PPS, 2010) was 10.4, (EU average 3.9). PCT patent applications by researcher (2010) was 0.027 (EU average 0.02).

¹¹⁷ http://www.fvca.fi/files/931/VC_PE_Industry_in_Finland_2014.pdf

License and patent revenues from abroad as a % of GDP (2012) was 1.34, (EU average 0.59). Community trademark (CTM) applications per million populations (2012) was 196, (EU average 152). Community design (CD) applications per million populations (2012) was 52, (EU average 29) ([PRH, Statistics over patent applications and patents](#) and [WIPO, Statistical Country Profile](#)).

While statistics on applications to national patent office are not always comparable across different countries, they can provide some indication of technological development activities that are not captured by EPO/PCT data. In Finland approximately 14 thousand patent applications were made at the EPO in the period 2000–2010. Approximately 16,000 patent applicants took the PCT route. The National Patent Office received over 38 thousand applications in this period (these three figures are based on fractional counting) (KU Leuven, Bocconi University, Patents and Licensing study for DG RTD – data release Summer 2014).

The number of national patent applications has been decreasing for several years but the number of international applications has increased until 2008 and after that remained about at the same level. This indicates the importance of global markets for a small economy such as Finland. The overview of figures regarding patent applications submitted by the Finns is presented in Table 8, ([PRH, Statistics over patent applications and patents](#) and [WIPO, Statistical Country Profile](#)). In Global Competitiveness Index Finland ranks 4th in PCT patent indicator (applications per population) (WEF 2015).

In April 2014, the government presented a new IPR action plan as part of a broader resolution on intangible value creation. The resolution on the previous IPR strategy was done in 2009 and it highlighted the importance of an effective IPR policy for the Finnish economy. It identified various actions for supporting the IPR environment. These included strengthening of the knowledge base and competence on IPR issues and assessing the bottlenecks of national IPR regulation and contributing to the development of EU level regulation (MEE 2014)¹¹⁸. Initiatives related to open innovation and IPR issues are discussed in Chapter 5.7.

Table 8 International patent applications submitted by Finnish applicants ([PRH, Statistics over patent applications and patents](#))¹¹⁹

Patent applications submitted by the Finns to	2007	2008	2009	2010	2011	2012	2013	2014
PCT	2009	2214	2123	2138	2079	2326	2103	1815
EPO	2039	1793	1444	1639	1571	1900	1895	2193
USPTO	2444	2621	2610	2772	2551	2760	2869	na
JPO	585	575	340	413	319	367	362	na
SIPO	973	979	897	1089	964	1069	1039	1165
KIPO	536	575	393	387	334	273	312	331

¹¹⁸ https://www.tem.fi/files/39580/vnp_aineettoman_arvonluonnin_kehittamisohjelmasta.pdf

¹¹⁹ <https://www.prh.fi/en/patentit/Tilastoja/vuositolastot.html>

UKIPO	80	67	73	50	52	72	173	166
Total	8666	8829	7880	8488	7870	8767	8717	

5.7 Public-private cooperation and knowledge transfer

Finland, as a leading innovator, has well-developed engagement between university and business sectors, although the current economic crisis is affecting its R&I landscape and activities. Performance is notably good in terms of public-private co-publications, the share of enterprises working with academia, numbers of start-up companies and the number of university-business research agreements. Finland also has a high degree of researcher mobility to the business sector. It also implemented the EC knowledge transfer recommendation to a high degree. A range of programmes are in place to support university-business collaboration and engagement and Finland is advanced in terms of open innovation. However, there are a number of changes planned to certain knowledge transfer programmes in the coming years under the new government which decided to make some important cuts to public R&D funding.

5.7.1 Indicators

Funding: BES-funded/publicly-performed R&D

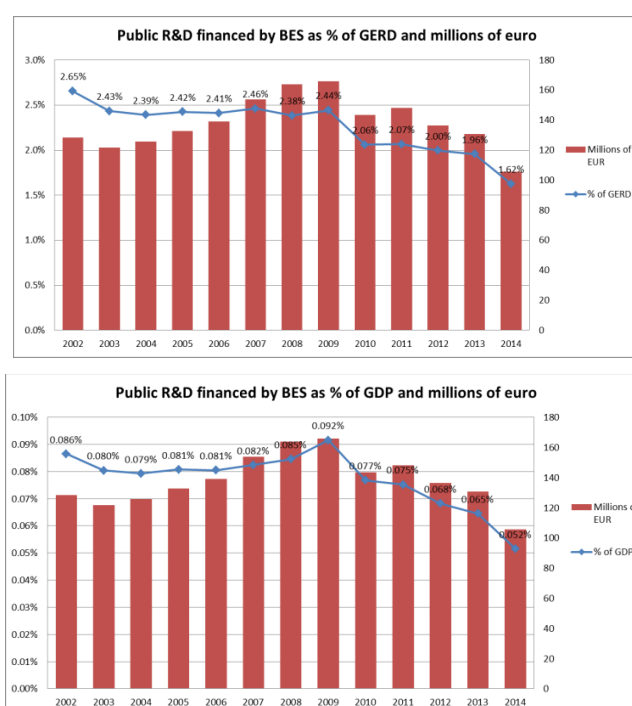


Figure 14 BES-funded public R&D as % of GERD (in €MLN) and % of GDP

Figure 14 shows that the level of business enterprise (BES)-funded public R&D declined since 2002 as a percentage of GERD from 2.65% to 1.62% in 2014, while in cash terms there was a peak in 2009 at €160m which declined to just over €100m in 2014.

As a percentage of GDP, it shows a rather stable trend 2002-2009 which is followed by a continual decline from 0.092% to 0.052% which is still higher than many EU-28 countries. Economic decline (and hence, GDP decline) started from industry. It is therefore logical that the BES funded R&D started to decline first, and the impact on GOVERD came with some delay.

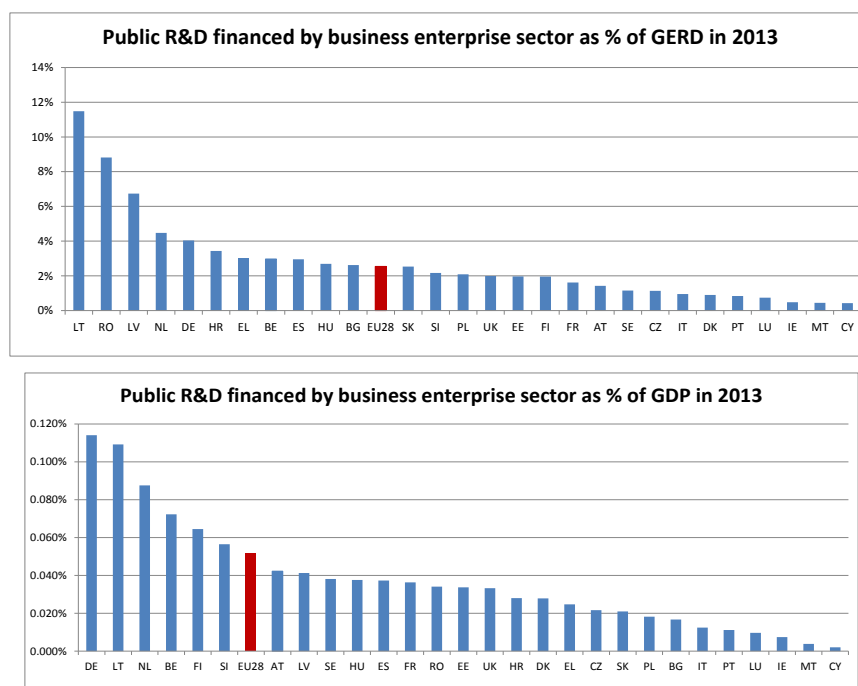


Figure 15 BES-funded public R&D as % of GERD and as % of GDP in 2013 in Member States¹²⁰

Figure 15 charts show the values of BES-funded public R&D in all EU-28 as percentages of GERD and GDP respectively.

Finland ranks below the EU-28 as a % of GERD while it is above it on % of GDP. Public-private cooperation is quite strong despite the declining trends, as although there are a number of schemes to support knowledge transfer, forms of public-private cooperation have changed. Enterprises and research organisations plan and execute cooperative projects with common goals and shared disciplines. Both give their resources, knowledge and efforts to the project without any money flows from an organisation to another, which can't be seen in available statistics. In general, incentives to academics, skills and differences in culture when working on R&D commercialisation also play a role in opportunities for engagement on the public research side. Programmes and funding to support knowledge transfer are run by the innovation funding agency Tekes. However, the recent decision to cut public R&D funding¹²¹ by the new government may affect Finland's performance in private-public cooperation in the coming years.

¹²⁰ 2013 was chosen as the latest data series providing a full comparison within EU-28.

¹²¹ http://valtioneuvosto.fi/documents/10184/1427398/Ratkaisujen+Suomi_EN_YHDISTETTY_netiti.pdf/8d2e1a66-e24a-4073-8303-ee3127fbfcac_pp.48

Funding: Structural funds devoted to knowledge transfer

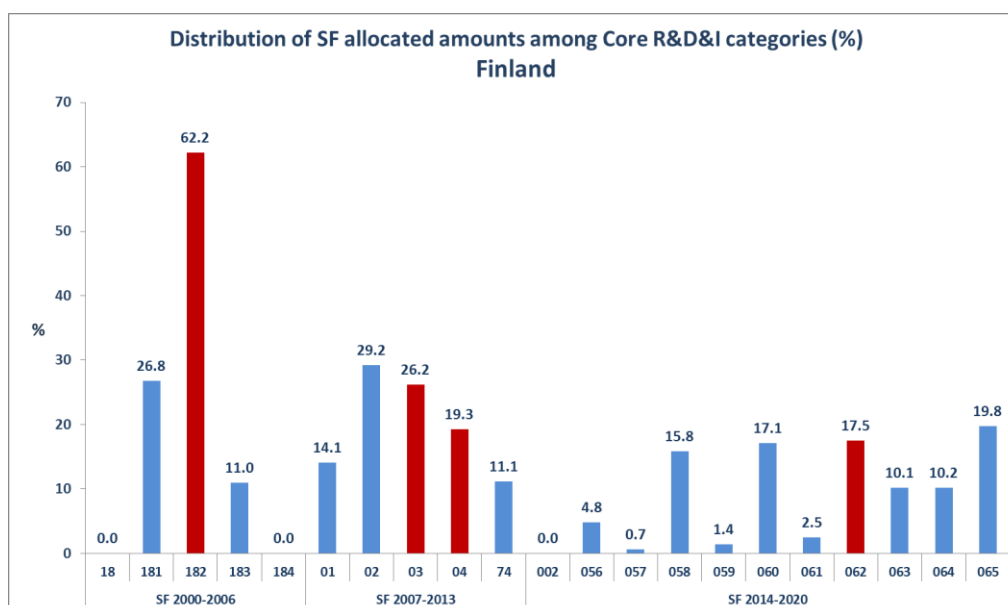


Figure 16 Structural Funds for core R&D activities 2000-2006, 2007-2013 and 2014-2020¹²². We use the categories: 182 (2000-2006), 03 and 04 (2007-2013) and 062 (2014-2020) as proxies for KT activities.

Finland allocated 17.5% of its structural funds for core R&D activities to technology transfer and university-enterprise cooperation primarily benefiting SMEs (62.2% for 2000-2006 and 45.5% 2007-2013). It is higher than the EU average of 15.7% for the 2014-2020 period (which was 26.1% for 2000-2006 and 30.1% for 2007-2013 respectively) though in relative terms much lower than for previous programmes.

¹²² Figure 16 provides the Structural Funds allocated to Finland for each of the above R&D categories. The red bars show the categories used as proxies for KT. Please note that the figures refer to EU funds and they do not include the part co-funded by the Member State. The categories for 2000-2006 include: 18. Research, technological development and innovation (RTDI); 181. Research projects based in universities and research institutes; 182. Innovation and technology transfers, establishment of networks and partnerships between business and/or research institutes; 183. RTDI infrastructures; 184. Training for researchers.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2007-2013 include: 01. R&TD activities in research centres; 02. R&TD infrastructure and centres of competence in specific technology; 03. Technology transfer and improvement of cooperation networks; 04. Assistance to R&TD particular in SMEs; 74. Developing human potential in the field of research and innovation.

The categories for 2014-2020 include: 002. Research and Innovation processes in large enterprises; 056. Investment in infrastructure, capacities and equipment in SMEs directly linked to Research and Innovation activities; 057. Investment in infrastructure, capacities and equipment in large companies directly linked to Research and Innovation activities; 058. Research and Innovation infrastructure (public); 059. Research and Innovation infrastructure (private, including science parks); 060. Research and Innovation activities in public research centres and centres of competence including networking; 061. Research and Innovation activities in private research centres including networking; 062. Technology transfer and university-enterprise cooperation primarily benefiting SMEs; 063. Cluster support and business networks primarily benefiting SMEs; 064. Research and Innovation processes in SMEs (including voucher schemes, process, design, service and social innovation); 065. Research and Innovation infrastructure, processes, technology transfer and cooperation of enterprises focusing on the low carbon economy and on resilience to climate change.

Cooperation: Share of innovative companies cooperating with academia

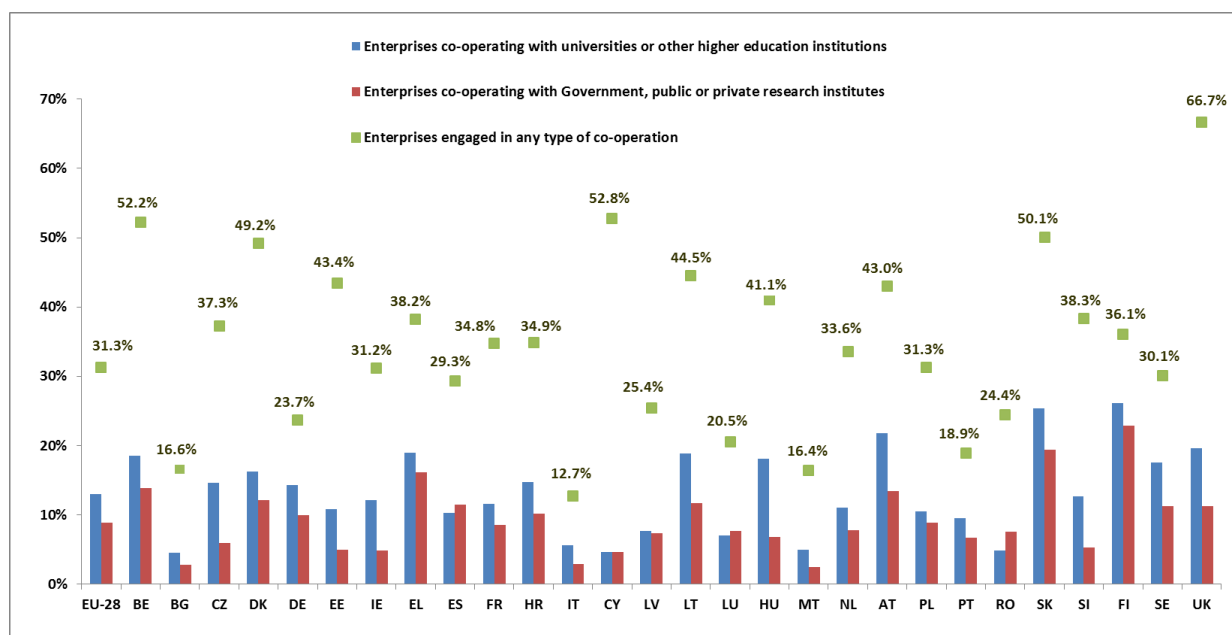


Figure 17 CIS survey 2012 – share of enterprises cooperating with academia

In Finland 36.1% of innovative enterprises are engaged in any type of cooperation which is above the EU-28 average level of 31.3%. Of these, 26% of innovative companies work with higher education institutions and 23% with government, public or private research institutes which are comparatively the highest of the EU-28.

Cooperation: Technology Transfer Offices (TTOs offices), incubators and technological parks

University and research institute-based technology transfer companies in Finland include Aboatech Oy, HU, Licensing Oy, Finntech Oy, Oulutech Oy, Tuotekehitytys Oy Tamlink. The main function is to commercialize the research results of their own institutions (Technical Research Centre of Finland -VTT, Universities), in cooperation with foreign companies when needed. As private companies they are able to make commercial research, development and exploitation agreements that the universities, VTT and researchers are not willing to make because of liabilities or risks involved.

Many brokers in Finland such as the Technology and Business parks, business offices of municipalities, and business or start-up hubs of universities have a mandate to build public-private partnership networks and collaboration. Further to the IPR legislation changes (2007), the introduction of the new University law (2010) made a fundamental change with regard to organisation of knowledge transfer in Finnish universities. The new law gave the mandate and responsibility of organising the knowledge transfer and BES -collaboration to the universities. The legal status of many universities also changes, as well as their approach to IPR incentives. Since then, universities have strengthened their knowledge transfer services and overall interest in these issues. At the same time, the role of technology parks and various other ('semi-public') knowledge transfer intermediaries have lessened, and many of those have been closed down. This is a long process and is still continuing. The network of Finnish Technology parks consist of about 29 technology or science parks around Finland. The largest are in Espoo (suburban Helsinki) and in Oulu (north Finland). Most of them support incubator activities for start-up or spin-off companies¹²³.

¹²³ http://www.tekel.fi/in_english/

Cooperation: Share of public-private co-publications

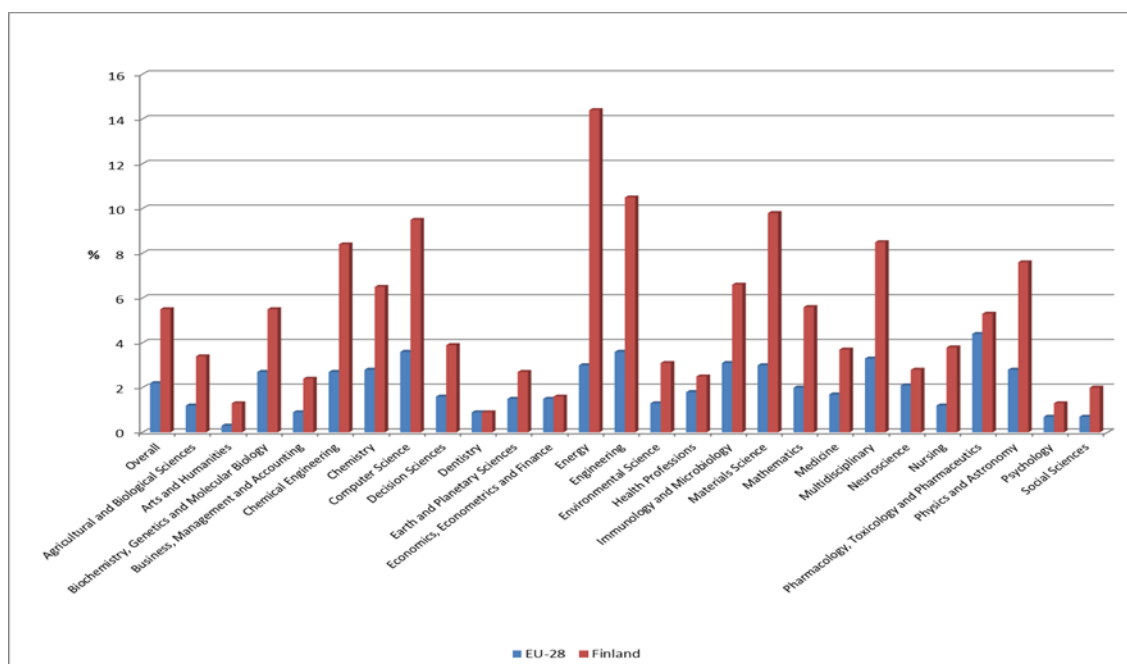


Figure 18 Co-publications by field 2003-2013. Scopus database

The areas with the highest percentage of public-private co-publications are Energy, Engineering, Materials science and Computer sciences. Overall, joint academia-business publications accounted for 5.1% of publications in 2013. This level is higher than in 2003, at 4.6% but lower than the 2009 peak of 6.1% though it remained fairly stable over the last ten years and well above the EU-28 average.

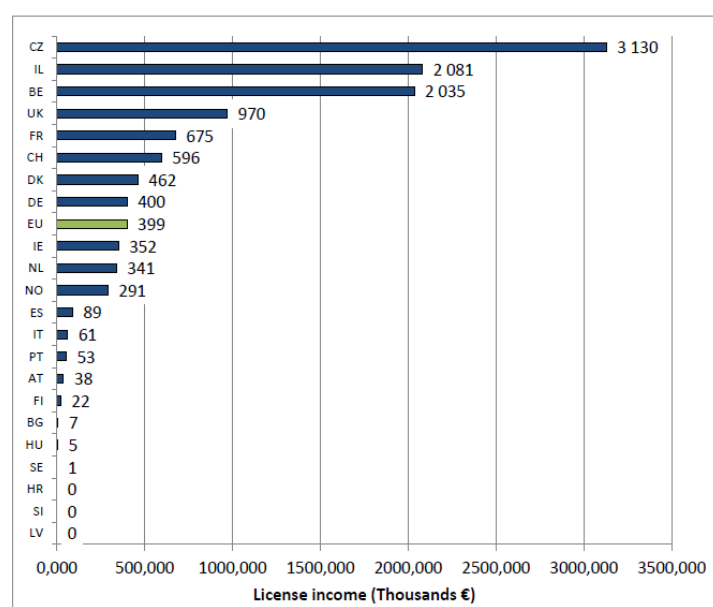
Finland had 155 public-private co-publications per million of population compared to 29 for the EU-28 (and 182 Denmark and 113 Sweden)¹²⁴.

Cooperation: Patenting activity of public research organisations and universities together with licensing income

According to the Knowledge Transfer Study Finland performs among the top 2 for number of research agreements (231.3/1 000 research staff) yet its performance is below the EU average on patents granted (1.3/1 000 research staff), on license agreements (4.1/1 000 research staff) and on license income (22 000 Euro/1 000 research staff).

¹²⁴ JRC IPTS RIO elaboration on Scopus data collected by Sciencemetric in a study for the European Commission DG RTD (Campbell, 2013). The share of public-private co-publications is derived from the Scival platform and is also based on Scopus data (September 2015). Scival® is a registered trademark of Elsevier Properties S.A., used under license. The data on public-private co-publications is not fully compatible with the data included in the IUS, due to differences in the methodology and the publication database adopted.

Exhibit 3-35: Thousands Euros of license income per 1,000 research staff by country, EKTIS 2011 and 2012 results combined



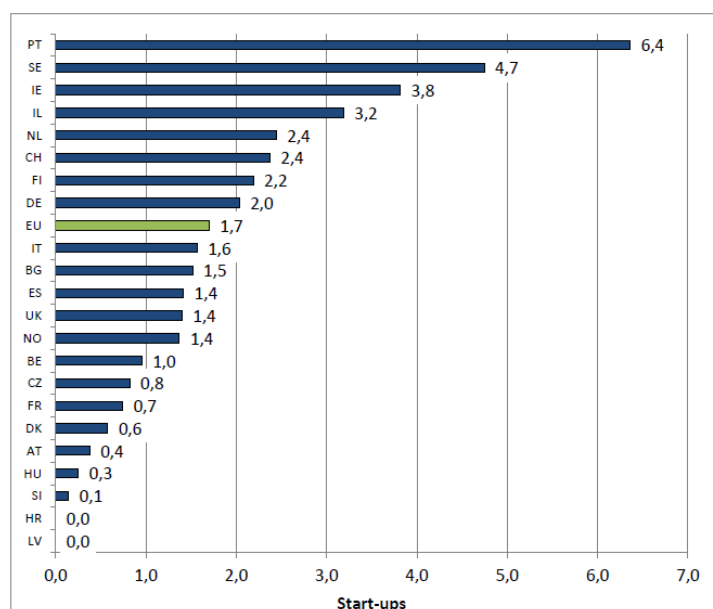
Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

Figure 19 License income per 1 000 research staff by country. EKTIS 2011-2012 survey

Cooperation: Companies

According to the Knowledge Transfer Study, Finland ranks 7th in terms of start-ups per 1 000 research staff at 2.2, above the 1.7 EU average.

Exhibit 3-33: Number of start-ups per 1,000 research staff by country, EKTIS 2011 and 2012 results combined



Source: MERIT, European Knowledge Transfer Indicator Survey 2011 and 2012.

Figure 20 Number of start-ups per 1 000 of research staff per country. EKTIS 2011-2012 survey

5.7.2 Policy measures

Among the legislation in the area of knowledge transfer in Finland is the University Inventions Act that came into operation in January 2007. This provided universities with the rights to the inventions made in externally funded research (rights to all inventions previously belonged to the academic inventors). This change saw an increasing focus by universities on commercialisation of research.

On the political level, innovation and research policy has been increasingly connected with societal issues (for example, globalisation, ageing, the environment and public health) that pose a challenge to growth and well-being. These challenges can be tackled with public sector innovation (or public procurement), growth entrepreneurship, service innovation as well as user and demand driven innovation. This policy framework also aims to support collaboration and engagement between the public and private sectors on these issues.

From a policy perspective, demand and user-driven innovation are central topics in the Finnish innovation policy. Within these approaches the government aims to develop competence and incentives for demand and/or user driven RDI activity, promote the cooperation between public and private actors (PPP partnerships), increase citizens' participation opportunities and develop co-operating models and platforms (e.g. Living Labs), ([MEE 2015](#)). The guidelines for the demand and user-driven innovation policy were established in an action plan in 2010 ([MEE 2010](#)).

Tekes is the main agency providing funding and support on a national scale to knowledge transfer. There are a number of schemes to support collaboration, internationalisation and start-ups.

Strategic Centres for Science, Technology and Innovation ([SHOK](#)) have been an important instrument to support R&D collaboration between research organizations (universities, applied sciences, research institutions) and businesses since its introduction in 2008. The main goal of SHOKs is to renew industry clusters and to create new innovations in key Finnish business sectors. The centres implement long-term research programmes (5-10 year time span) based on collectively formulated research strategy. The activities of SHOKs are coordinated by six non-profit limited companies. The shareholders represent relevant companies, universities and research institutes. In 2014, Tekes funding for SHOKs was €88m. In addition, the Academy of Finland funded basic research carried out in SHOKs.

However, according to the government programme the government has decided to cut funding resources and to close down *the special funding concept for SHOKs* which has been more generous than other funding concepts.

Another key instrument for promoting public-private partnerships has been the INKA programme, however, they will also be closed down. As part of the new spearhead initiatives, the government aims to launch a set of new actions to strengthen "competence centres" based on the experiences of INKA and SHOK programmes ([Finnish Government 2015](#)).

Tekes supports collaboration between research and industry by providing funding through four different funding concepts to incentivise collaboration. Three are aimed for research organisations and one for companies. The latter has been the most effective of these, mostly targeted to big companies using funding criteria which requires companies to buy research services from HEIs or PROs (or SMEs). Thus the funding is allocated through companies to HEIs, PROs and SMEs. This funding concept has impacted a major share of funding flows from companies to HEIs and PROs. Under the new government the decision was taken to cut most of these incentives.

The most common of these is funding for public research networked with companies, which aims to achieve competence and results that can be used as a springboard for the companies' own research and development projects. Another instrument is called "New knowledge and business from research ideas". It is targeted to research projects, where the project group prepares the commercialisation of a research idea. Strategic research openings are aimed for projects, which create new high-level competences in areas expected to be important for businesses in the future.

The government will launch new initiatives for developing the instruments for commercialisation of research results. Also new Tekes instruments (labelled as Challenge Finland, Innovation Scout and Research Benefit) will be introduced. The government will cut €130m *yearly funding* and to increase €59m temporary funding for 2016-2018 (altogether, not yearly). ([Strategic openings](#))([Finnish Government 2015](#)).

Regarding research in universities, there is an indirect incentive for cooperation as the funding model of universities rewards for outside funding, such as Tekes project funding. New government programme puts further pressure on universities and other research organisations to develop external funding sources. In addition the universities will be encouraged to develop collaboration with industry through incentives and steering processes.

Various initiatives related to open innovation have emerged recently in Finland. The Innovation Mill, launched in 2009, is a concept for commercialising "non-core" corporate IPR from large companies by spinning off start-ups and new business lines in SME's. It is coordinated by a private service provider and funded by Tekes. Total funding of Innovation Mill in 2009-2014 has been €84m of which €42m has been public (Tekes) funding. In this case the research has already been executed - often by big companies and research organisations together - and patented, with Innovation Mill commercialising the results. ([Innovation Mill](#))

There are also several more regional open innovation initiatives such as Demola, Protomo and Urban Mill to name a few. Most of them combine funding from various private and public sources (e.g. cities, universities, ministries, Sitra, ELY Centres and structural funds). Demola, first launched in Tampere in 2008, is an open innovation platform and university-business collaboration model, where team of students work to solve challenges presented by companies and other organizations. 80 % of the results (demos, prototypes) are bought by the companies through a specifically developed licensing system. The concept has been disseminated to various other cities in other countries. Protomo labels itself as a development for starting businesses. It provides work space, mentoring and networking for developing ideas into commercially viable business concept. According to Protomo, it has contributed to the creation of 288 start-ups since its launch in 2009. It currently operates in three Finnish cities. Urban Mill calls itself as "Co-working and Co-creation Platform Prototype for Urban Innovations". Basically it is a physical co-creation and co-working space in the Aalto University facilities. It brings together different research and innovation actors, mostly involved with built environment, ICT and urban services. The concept was piloted in 2013 and in 2015 has been in full operation. All in all, these kind of "lightweight low threshold" open innovation concepts have become increasingly popular in Finland and represent a trend which is likely to continue in the coming years. ([Demola](#)) ([Protomo](#)) ([Urban Mill](#))

5.8 Regulation and innovation

Improvement of the regulatory framework for business is among the top priorities in the new government Programme. The programme acknowledges that "due to excessive regulation and administration, Finland has lost its agility and competitiveness". The government Programme further states that "The government will assess all EU regulation from the perspective of economic growth, competitiveness and jobs, and will also require a corresponding approach by EU institutions." The implementation plan of the Government Programme identifies several actions that will reduce the regulatory burden of companies.

Much of this deregulation focuses on labour market issues or promoting open markets and competition environment. However, by the time of writing, these actions have not yet been identified in detail. It is likely that in terms of new innovations the most relevant actions are related to the priority sectors (cleantech, digitalisation, bioeconomy and health services).

5.9 Assessment of the framework conditions for business R&I

In international comparisons, the overall Finnish framework conditions for business research and innovation are systematically well-ranked, being often amongst the leading European countries. Finland indeed offers a strong competence base, good educational system, well-performing research institutions and government sector, as well as good enforcement of law overall. Finland also ranks well in patenting comparisons. Weaker aspects are, however often related to high taxation, small domestic markets and poor labour market efficiency, for example. SMEs report access to finance being one of their most pressing challenges. The small size of the domestic market is one factor why Finland is not a very attractive target for foreign direct investments, except in some very specific sectors of unique competence (e.g. software and gaming).

Over the last decade, the Finnish economy has been going through major structural reforms and the earlier strong export sectors (e.g. forestry and paper, metal industry, ICT) have radically diminished. In response, the economic policy has focused increasingly on facilitating swift industrial reforms and in supporting start-ups and high growth companies. A wealth of support instruments and programmes has been established to that end. The current policy approach does include demand-side measures (such as public procurement for innovation), while the majority are still supply-side instruments. Much emphasis has been put on increasing the performance of public policies for R&I and internationalisation through joint activities and strategic programmes; the new Team Finland and the Council of Strategic Research are prime examples in that regard.

6. Conclusions

Meeting structural challenges

Finnish strategic objectives for research and innovation policies have undergone gradual changes during the last years - largely initiated by the 2009 international evaluation of the R&I system. The key weaknesses identified in the evaluation related to the lack of growth entrepreneurship and difficulties in internationalisation.

The mix of Finnish policy measures aimed at addressing the identified R&I challenges and their effectiveness is set out in the table below:

	Policy measures/actions	Assessment: appropriateness, efficiency and effectiveness
Innovation to boost productivity and competitiveness	<p>The Finnish National Reform Programme (2012).</p> <p>The latest recommendations of the RIC (2014)</p> <p>Structural development of higher education including new funding model (2013 and 2015).</p> <p>The reform of research institutes and research funding, infrastructure policy and setting up the tenure track system (starting 2014).</p> <p>The new Government programme (2015):</p> <p>i) strengthening competitiveness by improving conditions for business and entrepreneurship by reforming key legislation and removing sectoral regulation that prevents competition, ii) strengthening cooperation between higher education institutions and business life will be strengthened to bring innovations to the market, iii) aiming at deregulation and the reduction of the administrative burden iii) creating a culture of experimentation especially by increasing innovative public procurement.</p> <p>The Government's objective to use business aid to restructure the economy and industry and to boost the internationalisation of companies; at the same time the Government significantly cuts R&D grants for enterprises.</p>	<p>Improving the economic competitiveness and reforming the research and innovation system are at the top of the political agenda of the current Government. Most of the Government Programme's strategic objectives and specific plans (spearhead projects) are closely relevant to these goals. Policy programmes for new growth areas, such as clean technology, biotechnology and digitalisation are promising but still relatively small-scale.</p> <p>Progress has been very positive in some sectors like health technology and ICT related services.</p> <p>The target to increase the share of innovative public procurement up to 5% is a strong incentive for innovation, although the means to reach the target have not been defined.</p> <p>Government's objectives are welcomed from an R&I policy perspective. However, the significant further cuts to the government research and innovation funding especially on its priority areas cause concern. Allocations of public R&D funding to research boosting growth and competitiveness of industries have been modest in Finland, they have further been cut in 2011-2014, and the cuts will continue. Incentives for business R&I will remain on a low level compared to competing economies The incentives for business – higher education cooperation will mostly be cut. In many respects, the focus of these cuts is not aligned with objectives in the Government Programme.</p>

	<p>Focus of most state aids from direct grants to refundable forms of funding, such as loans, guarantees and equity investments.</p> <p>The target to increase the share of innovative public procurement up to 5%.</p> <p>The policy reforms are targeted at increasing the number of high-growth innovative companies.</p> <p>A temporary tax incentive for private investment in start-ups.</p> <p>Vigo accelerators.</p> <p>Tekes Venture Capital Ltd adopts asymmetric profit distribution mechanisms functioning as the fund of funds.</p> <p>Tekes funding has been focused on start-ups.</p> <p>Widened Finnvera's mandate.</p> <p>Release of non-sensitive public data as open data.</p> <p>Policy initiatives focusing on structural reforms to improve the sustainability of the public finances, the most significant of the reforms being pension and health care reforms.</p>	<p>Implementation of the new university funding model is a good step forward in rewarding for quality and internationalisation, but incentives for creating socio-economic impacts are not yet in place.</p> <p>Policy initiatives focusing on structural reforms to improve the sustainability of the public finances aiming at fiscal consolidation, and increasing the labour supply were necessary, but the reforms will not significantly raise the productivity. Major decisions in many areas of policy are further needed, one of them being the reduction in production costs relative to Finland's trading partners. Moreover, the need for removing regulatory controls that limit competition and innovation still remains. New means are especially needed to increase multifactor and labour productivity of the whole economy by introducing R&I measures which aim at broadening the innovation base, and increasing the incentives for R&I and risk-taking of businesses and capital.</p>
A new growth mode for public and private R&I investments	<p>The debate on how to address lagging technology exports, weak productivity growth, and diversification in business R&D is on-going.</p> <p>A number of measures have been taken to address this complex challenge. The outcomes so far include</p> <p>R&I recommendations 2015–2020 by the RIC (2014)</p> <p>The action plan and policy framework for demand and user-driven innovation by MEE</p> <p>the reform of the Act on Public Procurement, so that public procurements pay greater attention to innovation (2015)</p> <p>a joint-service 'Growth Track' intended for enterprises aiming at rapid growth and internationalisation</p> <p>the new strategy of Tekes with emphasis on growth companies, and the Tekes funding concept for young,</p>	<p>The focus of public R&I funding has been effectively shifted to SMEs, which are growth-oriented, job creating and successfully establishing international connections.</p> <p>Incentives for the cooperation between businesses and public research organisation have worked well until now despite the low level of these incentives.</p> <p>Due to cuts in 2011–2014 and the new decisions by the Government, the level of incentives for cooperation, and public funding allocations to research boosting growth and competitiveness of companies will remain modest, and incentives for business R&I will remain on a low level compared to competing economies.</p> <p>The Government's decision to shift the focus from direct grants to refundable forms of funding do not increase R&D investments of businesses.</p> <p>A lack of know-how in dismantling units of PROs, and</p>

	<p>innovative enterprises and new companies and VC - start-up ecosystem</p> <p>the Smart Procurement Programme (2013–16)</p> <p>establishment of Tekes Venture Capital Ltd fund of funds with the possible of asymmetric distribution of profits</p> <p>the enlargement of Finnvera's mandate</p> <p>the expansion of the Vigo Accelerator Programme</p> <p>a tax incentive for private investors</p> <p>an ICT 2015 working group's (2012) strategy to mitigate the effects of the sudden structural change</p> <p>the Governmental decision on central government spending limits for 2014–2017 in April 2013.</p> <p>Finland's smart specialisation strategy</p> <p>reductions in government R&D budget allocations for 2015-2016 by €153m</p>	<p>functions and renewal through reallocating resources is hindering the progress for efficiency.</p> <p>Finland's smart specialisation plans could offer greater clarity, stronger focus and resource allocation as well as include advanced monitoring and evaluation mechanisms.</p> <p>The cuts in funding for universities and public research organisations will decrease public R&D investments but may increase strategic focus and the scientific excellence.</p> <p>Despite the good targets of the Government, there are few practical means to increase R&D investments in Finland and it seems evident that Finland is not able to meet its official 4 % R&D intensity target.</p>
Swift implementation of R&I policy and governance plans	<p>The university reform (2010).</p> <p>The Polytechnic reform (2011, implemented 2014).</p> <p>The reform of the research institutions and research funding (2012, starting 2014).</p> <p>A new university funding model (2013, 2015), will be renewed 2017</p> <p>The adjusted strategies of the major R&I funding agencies (Academy & Tekes) based on evaluations.</p> <p>Establishment of the Council for Strategic Research and the Team Finland concept .</p>	<p>It is seen very positive that reforming the national research and innovation system is among the strategic objectives of the new Finnish Government For many parts, this is likely to mean the follow-through of the revisions planned and started earlier. Anyhow many, if not most, of the reforms will take several years before the organisations are functioning with full efficiency and have found their new roles in the system. Changes particularly in the university sector and research institutions have been slow to take their full effect.</p> <p>At the same time, the volume of specific government measures to this end (spearhead projects) is quite marginal compared to decisions and budget cuts introduced in the R&I sector, namely decisions to further cut government expenditure on RDI, (including Tekes funding to key programmes).</p> <p>The decision to further shift the allocation of existing funding from grants to returning instruments (loans, guarantees, VC) will have an additional impact on the overall functioning of the business R&D incentives, moving the balance from competence building to close-to-market activities.</p> <p>The results of the evaluation of the RIC have been considered by the new Government and the degree concerning RIC has</p>

	<p>Research and Innovation Council's (RIC) new guidelines 2014–2020 aiming to improve the R&I system and governance.</p> <p>The Central Administration Reform Project (KEHU) to improve coordination and coherence in government.</p> <p>The evaluation of the RIC</p>	<p>been amended in March 2016.</p> <p>When assessments and evaluations are increased, the Government strengthens its own policy intervention, which may discourage operational public-private partnerships to find focus and allocate resources.</p> <p>The need to improve the quality of assessment and evaluation measures grow as their role becomes stronger. The needs are especially related to indirect impacts, long term effects and counter-factual analyses.</p>
Ensuring a strong science base	<p>The new University funding model (2013, 2015).</p> <p>The structural development scheme for polytechnics implemented in 2014.</p> <p>The reform of research institutes and research funding (starting 2014) including the establishment of Council of Strategic Research (SRA) in 2014.</p> <p>R&I recommendations for 2015-2020 by the RIC.</p> <p>Finnish Research Infrastructure Committee, updated Finland's national roadmap for infrastructures 2013.</p> <p>The mergers of the centres of excellence by the Academy of Finland to form larger centres to help solve the problem of funding being spread too thinly.</p> <p>Government reallocated €50m from universities' institutional funding to competitive funding (Academy of Finland), and decided further cuts to university institutional funding.</p>	<p>Clear results can only be assessed in a longer term, though science quality has shown improvement as a result of excellence-driven funding models and advances in structural reforms of funding agencies, research institutes and universities. Some mergers have also taken place.</p> <p>To date, the means for coordinating and strengthening universities' strategic choices have been soft and results have been achieved quite slowly. The decisions of the Government may boost the process.</p>

<p>Increase internationalisation of R&I</p>	<p>University funding model reforms in 2013 and 2015 sought to increase incentives for internationalisation.</p> <p>Finland Distinguished Professor Programme (FiDiPro) scheme to attract high level foreign talent to Finland.</p> <p>VC funding through the Vigo Accelerator and by YIC funding scheme by Tekes aiming to attract foreign investment for start-ups in Finland.</p> <p>Team Finland strategy for promoting foreign investment (2012) aiming to exceed the EU average in the stock of FDI as a share of GDP by 2020.</p> <p>International companies conducting R&D activities in Finland can apply for Tekes' funding even without being registered in Finland or having a Finnish partner, assuming and requiring that there are economic impacts anticipated in Finland.</p>	<p>Up until now, the overall progress with regard to increasing the internationalisation of R&I in Finland has been modest, although for some schemes it is too early to assess</p> <p>The share of foreign students in universities increased by 75 % (2007–2012), but the level is still very low. Co-publishing with foreign researchers has increased slowly but continuously.</p> <p>In terms of attracting foreign human expertise, schemes like FiDiPro continue to enhance the international dimension of universities and research institutes.</p> <p>The moderate share of foreign R&D in the private sector is partially explained by the Finnish business structure, having few foreign affiliate companies. Although there is some notable progress, the pace is still slow.</p> <p>The slow progress may reflect the lack of internationalisation of the economy and society as a whole, including the immigration policies.</p> <p>Finland slightly increased its applications to H2020 compared with FP7, though saw a slight decline in signed grants. Finland should continue to foster participation in EU programmes to support its internationalisation aims.</p>
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Abbreviations

AAI	Authentication and Authorisation Infrastructures
AVAA	Open-access Publishing System; Avointen aineistojen julkaisualusta
ATT	Open Science and Research; Avoin tiede ja tutkimus
BBMRI	Biobanking and Biomolecular Resources Research Infrastructure
BEAM	Business with Impact Programme of Team Finland
BERD	Business Expenditures for Research and Development
BES	Business Enterprise Sector
BoD	Board of Directors
CD	Community Design
CERN	European Organisation for Nuclear Research
CESSDA	Consortium of European Social Science Data Archives
CLARIN	Common Language Resources and Technology Infrastructure
CLEEN	a SHOK for Energy and the environment
CLIC	a SHOK for Cleantech and bioeconomy
CoE	Centre of Excellence
COST	European Cooperation in Science and Technology
CSR	Council for strategic research in the Academy Finland; STN, Strategisen tutkimuksen neuvosto
CSC	IT Centre for Science; Tieteellinen laskenta
CTM	Community Trademark
DAC	OECD Development Assistance Committee
DIGILE	a SHOK for Information and communication industry and services
EATRIS	European Infrastructure for Translational Medicine
EC	European Commission
ECA	Export Credit Agency
EDUGAIN	a federated AAI service between the GÉANT Partners
EduROAM	Education Roaming, an international roaming access service
EK	Confederation of Finnish Industries; Elinkeinoelämän keskusliitto
ELIXIR	European Life Science Infrastructure for Biological Information
ELY	Centres for Economic Development, Transport and the Environment; Elinkeino-, liikenne- ja ympäristökeskus
EMBL	European Molecular Biology Laboratory
EPO	European Patent Office
ERA	European Research Area
ERA-NET	a funding instrument within the EU Framework Programme
ERDF	European Regional Development Fund; EAKR, Euroopan aluekehitysrahasto
ESF	European Social Fund; ESR, Euroopan sosiaalirahasto
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
ESO	European Southern Observatory
ESRF	European Synchrotron Radiation Facility
ESS	European Social Survey
EU	European Union
EURACCESS	Researchers in Motion, a pan-European initiative for researchers

EURODOC	European Council of Doctoral Candidates and Junior Researchers
EUROHORCS	European Heads of Research Councils
EU-28	European Union including 28 Member States
Eurostars	a joint programme between EUREKA and the European Commission
EVCA	European Private Equity and Venture Capital Association
FDI	Foreign Direct Investments
FIBIC	a SHOK for Finnish Bioeconomy Cluster
FII	Finnish Industry Investment Ltd, TESI, Teollisuussijoitus Oy
FIMECC	a SHOK for Metal products and mechanical engineering;
FIN-CLARIN	a Finnish part of the European CLARIN collaboration
FIRI	Finnish Research Infrastructure Committee in the Academy Finland; Suomalainen tutkimusinfrastruktuuri -työryhmä
FNBE	Finnish National Board of Education; Opetushallitus
FP Development	European Framework Programme for Research and Technology
FP7	7 th Framework Programme
FSD	Finnish Social Science Data Archive; Yhteiskuntatieteellinen tietoaarkisto
FTE	Full Time Equivalent
FUNET	Finnish University and Research Network, a Finnish NREN
FVCA	Finnish Private Equity and Venture Capital Association
GAP	Global Access Programme is a MAP (USA) of Tekes
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GEANT NRENs	a pan-European research and education network interconnecting Europe's
GERD	Gross Domestic Expenditure on R&D
GII	Global Innovatoin Index
GOVERD	Government Intramural Expenditure on R&D
GSI/FAIR	Facility for Antiproton and Ion Research
HAKA	an identity federation for the Finnish higher-education and research institutions; Käyttäjätunnistusjärjestelmä
HEI	Higher Education Institutions; Korkeakoulut
HGF	High Growth Firms
HPC	High Performance Computing
HR	Human Resources
HT	High Technology
ICOS	Integrated Carbon Observation System
ICT	Information and Communication Technology
IDA	a research data storage system
IDT	Innovative Doctoral Training
INKA	Innovative Cities Programme; Innovatiiviset kaupungit -ohjelma
INSTRUCT	Integrating Structural Biology
InTo	Coming to work in Finland Portal
IP	Intellectual Property
IPP	Vietnam-Finland Innovation Partnership Programme
IPR	Intellectual Property Rights
ISCED	International Standard Classification of Education

IT	Information Technology
ITER	International Thermonuclear Experimental Reactor
IU	Innovation Union
JRC	Joint Research Centre
Kela	Social Insurance Institution of Finland; Kansaneläkelaitos
KIS	Knowledge Intensive Services
KIPO	Korean Patent Office
KKS	Planning for Growth –instrument of Tekes; Kansainvälisen Kasvun Suunnitelma
KOTUMO	Collaboration Programme between Universities and research insitutions; Korkeakoulujen ja tutkimuslaitosten yhteistyön syventäminen
KPI	Key Performance Indicator
LMI	Lean Market Initiative
MAP	Market Access Programme of Tekes
MEC	Ministry of Education and Culture; OKM, Opetus- ja kulttuuriministeriö
MEE	Ministry of Employment and the Economy; TEM, Työ- ja elinkeinoministeriö
MFA	Ministry for Foreign Affairs of Finland; Ulkoasianministeriö
MFR	Money Follows Researcher
MHT	Medium-high technology
MIKES	Research institute for measurement science and technology (metrology); Mittatekniikan keskus
MS	Member State
NGO	Non-Governmental Organisations
NLS	National Land Survey of Finland; MML, Maanmittauslaitos
NORDUnet towards GÉANT	a Nordic Infrastructure for Research & Education, a Nordic representative
NREN	National Research and Education Network
NRP	National Reform Programme; Kansallinen uudistusohjelma
NUS	National University of Singapore
OA	Open Access
OECD	Organisation for Economic Cooperation and Development
OSKE	Centre of Expertise Programme; Osaamiskeskusohjelma
PCT	Patent Cooperation Treaty
PE	Private Equity
PNP	Private non-profit; voittoa tavoittelematon
PPP	Public-private-partnership
PRH	Finnish Patent and Registration Office; Patentti- ja rekisterihallitus
PRO	Public Research Organisation
PRACE	Partnership for Advanced Computing
REFEDS	Research and Education Federations
REMS	Resource Entitlement Management System
RIC	Research and Innovation Policy Council; TIN, Tutkimus- ja innovaationeuvosto
RIS3	Research and Innovation Strategies on Smart Specialisation
RTDI	Research, Technological Development and Innovation
RYM	a SHOK for Built environment innovations

R&D	Research and Development
R&I	Research and Innovation
SA	Academy of Finland; Suomen Akatemia
SAIS	Southen Africa Innovation Support Programme
SalWe	a SHOK for Health and wellbeing
SBA	Small Business Act
SBIR	Small Business Innovation and Research
SEM	School of Economics and Management (Tsinghua University)
SF	Structural Funds; Rakennerahastot
SHOK	Strategic Centre for Science, Technology and Innovation; Strategisen huippuosaamisen keskittymä
SIPO	China Patent Office
SITRA	Finnish Innovation Fund; SITRA - Suomen itsenäisyyden juhlarahasto
SLUSH	An event for Eurasian start-ups to meet with international investors, executives and media.
SME	Small and medium sized enterprise
SRC	Strategic Research Council; STN, Strategisen tutkimuksen neuvosto
SYKE	Finnish Environment Institute; Suomen ympäristökeskus
TANZICT	The Information Society and ICT Sector Development Project in Tanzania
Tekes	Finnish funding agency for innovation; Innovaatiorahoituskeskus Tekes
VC	Venture Capital
TESI	Finnish Industry Investment Ltd, FII; Teollisuussijoitus Oy
TTA	National Research Data Project
TULI	Business from Research, a Tekes Programme; Tutkimuksesta liiketoimintaa
TUTL	New knowledge and business from research ideas, a Tekes funding concept; Tutkimusideoista uutta tietoa ja liiketoimintaa
VIGO	Business accelerator; VIGO-kiihdyttämöohjelma
VTT	Technical Research Centre of Finland; Teknologian tutkimuskeskus VTT Oy
UC	University of California
UCLA	University of California in Los Angeles
UK	United Kingdom
UKIPO	UK Patent Office
UNIFI	Universities Finland, a co-operational organisation for Finnish universities
USPTO	US Patent Office
US	United States
WEF	World Economic Forum
Wos	Web of Science
YIC	Young Innovative Company; NIY, Nuori innovatiivinen yritys

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Annex 1 – List of the main research performers

Top ten public research organisations ranked by the order of magnitude of research volume

Research organisation	Rank in Finland	Research expenditures (€ mill.)	Research man-years (2013)
University of Helsinki	1	315	3300
VTT Technical Research Centre of Finland Ltd	2	250	2400
Aalto University	3	215	2010
Natural Resources Institute Finland LUKE	4	120	1070
University of Oulu	5	115	1330
University of Turku	6	115	1300
University of Eastern Finland	7	105	1090
University of Jyväskylä	8	95	1080
Tampere University of Technology	9	75	890
University of Tampere	10	70	740

https://www.tilastokeskus.fi/til/tkker/2015/tkker_2015_2015-02-26_tau_005_fi.html

<http://www.aka.fi/fi/tiedepoliittinen-toiminta/tieteen-tila/>

Top ten Finnish companies ranked by R&D (European Commission; the Economics of Industrial Research & Innovation (IRI), World – 2500 companies ranked by R&D)¹²⁵

Global Rank	Name	Industrial sector	R&D 2013 (€mill)	R&D 1 year growth (%)	R&D 3 years growth (%)	R&D intensity (%)
29	NOKIA	Technology Hardware & Equipment	3456,0	-17,1	-11,2	14,7
385	WARTSILA	Industrial Engineering	218,0	2,8	14,0	4,7
479	HUHTAMAKI	General Industrials	161,4	948,1	115,6	6,9
730	ORION OYJ	Pharmaceuticals & Biotechnology	97,7	-2,3	7,0	9,7
741	KONE	Industrial Engineering	96,5	12,1	10,8	1,4
833	STORA ENSO	Forestry & Paper	82,0	0,2	0,9	0,8
902	AMER SPORTS	Leisure Goods	74,1	5,6	9,9	3,5
1037	METSO	Industrial Engineering	60,0	-52,4	-16,8	0,9
1118	VALMET	Industrial Engineering	54,0	-5,3	-2,9	2,1
1124	CARGOTEC	Industrial Engineering	53,2	-24,0	14,8	1,7

Note: The IRI scoreboard doesn't include the R&D expenditures of the Finnish affiliates of multinationals. For example the R&D expenditures of ABB Finland were €204m in 2014
<http://new.abb.com/fi/abb-lyhyesti/suomessa>

¹²⁵ <http://iri.jrc.ec.europa.eu/scoreboard14.html>

Annex 2 – List of the main funding programmes

Name of the funding programme	Timeline	Budget Total (€ mill)	Tekes funding (€ mill)	Target group
Tekes programmes ¹²⁶				HEIs, PROs, companies
Ongoing Tekes programmes				
<u>5th Gear</u>	2014–2019	100	50	
<u>Arctic Seas</u>	2014–2017	100	45	
<u>BEAM – Business with impact</u>	2015–2019	50	25	
<u>Bits of Health</u>	2014–2018	100	50	
<u>EVE – Electric Vehicle Systems</u>	2011–2015	100	50	
<u>Feelings – Intangible value creation and experienced value</u>	2012–2018	100	50	
<u>Green Growth – Towards a Sustainable Future</u>	2011–2015	80	40	
<u>Green Mining</u>	2011–2016	60	30	
<u>Industrial Internet – Business Revolution</u>	2014–2019	100	50	
Innovations in Social and Healthcare Services	2008–2015	100	50	
<u>Innovative Cities</u>	2014–2017	30	10+10+10 *	
<u>Liideri – Business, Productivity and Joy at Work</u>	2012–2018	170	85	
Skene – Games Refueled	2012–2015	70	30	
Smart Procurement	2013–2016	60	30	
<u>Witty City</u>	2013–2017	100	40	
<u>Mobility as a Service</u>	2014- 2015**	4.6	2.8	
*Cities+state+ERDF; the Government decided to cancel the				

¹²⁶ <http://www.tekes.fi/en/programmes-and-services/tekes-programmes/>

programme ** Will probably continue				
Completed Tekes programmes, effective during the last 3 years				
<u>BioIT</u>	2012–2014	16.6	9.3	
<u>BioRefine – New Biomass Products</u>	2007–2012	279.3	42.6	
<u>Built Environment</u>	2009–2014	85	37	
<u>Digital Product Process</u>	2008–2012	82.6	34.6	
<u>Fuel Cell</u>	2007–2013	82.8	44.5	
<u>Functional Materials</u>	2007–2013	142.1	78.7	
<u>Groove – Growth from Renewables</u>	2010–2014	102	53.5	
<u>Learning Solutions</u>	2011–2015	38.8	20.8	
<u>Safety and Security</u>	2007–2013	136.1	67.3	
<u>Sapuska – Added Value for International Food Markets</u>	2009–2012	33.8	16.8	
<u>Serve – Pioneers of Service Business</u>	2006–2013	201.6	94.8	
<u>Spaces and Places</u>	2008–2012	77.3	37.9	
<u>Sustainable Community</u>	2007–2012	96.9	49.8	
<u>Tourism and Leisure Services</u>	2006–2012	26.3	15.3	
<u>Trial – Environment for Cognitive Radio and Networks</u>	2011–2014	33.8	15.3	
<u>UbiCom – Embedded ICT</u>	2007–2013	330.9	147.6	
<u>Water</u>	2008–2012	95.8	50.2	
Tekes ongoing Changing Campaigns	not defined			companies
Health India		3	2	
<u>Innovation funding for media developments</u>		12.9	6.8	
<u>Nanotech Finland China – Partnering with China</u>		3.6	2.3	
<u>Take a digital boost to international markets!</u>		1.3	0.7	
Team Finland LetsGrow➡		1.3	0.6	

Research programmes of the Academy of Finland	Timeline		Academy funding (€ mill) ^P	HEIs and PROs
Ongoing Academy programmes				
<u>Arctic Academy Programme, ARKTIKO</u>	2014–2018		15.8 (2.5)	
<u>Computational Science, LASTU</u>	2010–2016		14.7	
<u>Digital Humanities, DIGIHUM</u>	2016–2019		5 (2)	
<u>Mineral Resources and Material Substitution, MISU</u>	2014–2019		12	
<u>New Energy</u>	2015–2017		12.7 (2.4)	
<u>Personalised Health – From Genes to Society, pHealth</u>	2015–2019		9.9 (2)	
<u>Programmable Materials, OMA</u>	2012–2016		10	
Sustainable Governance of Aquatic Resources, AKVA	2012–2016		12	
<u>Synthetic Biology, FinSynBio</u>	2013–2017		9.4 (0.7)	
<u>The Future of Learning, Knowledge and Skills, TULOS</u>	2014–2017		12	
<u>The Future of Living and Housing, ASU-LIVE</u>	2011–2015		11 (0.5)	
<u>The Health and Welfare of Children and Young People, SKIDI-KIDS</u>	2010–2015		14.6	
<u>The Human Mind, MIND</u>	2013–2016		13.4	
Completed Academy programmes, effective during the last 3 years				
<u>Climate Change, FICCA</u>	2011–2014		17.1	
Nutrition, Food and Health ELVIRA	2007–2014		7	
<u>Photonics and Modern Imaging Techniques (2010–2013)</u>	2010–2013		13	

<u>Sustainable Production and Products KETJU</u>	2006-2013		10.8	
<u>Sustainable energy SusEn</u>	2008-2014		18.4	
<u>Responding to Public Health Challenges, SALVE</u>	2009-2012		9.3	
<u>Ubiquitous Computing and Diversity of Communication MOTIVE</u>	2009-2012		9	
^p Planned addition to the funding (in brackets)				
Strategic Research Council (SRC) programmes			55.7	HEIs, PROs, companies
SRC announced three strategic research programmes, based on the three themes selected for 2015				
<u>Disruptive Technologies and Changing Institutions</u>	2015-			
<u>A Climate-Neutral and Resource-Scarce Finland</u>	2015-			
<u>Equality in Society</u>	2015-			
SRC proposes four themes to the Finnish Government to be decided in Autumn 2015				
<u>Knowledge, Know-How and the Changing Working Life</u>	2015-			
<u>Health and the Changing of Lifestyles</u>	2015-			
<u>Global Security in a Finnish Context</u>	2015-			
<u>Dynamics of Urbanisation</u>	2015-			
SRC has identified three horizontal focus areas that cut across all four themes above				
International engagement				
Digitalisation				
Life course				

Annex 3 – Evaluations, consultations, foresight exercises

Foresight

Prime Minister's Office Reports 2/2014; Cooperative and continuous foresight - A proposal for a national foresight approach

Prime Minister's Office Publication 18/2013; Valtioneuvoston tulevaisuusselonteko: kestäväällä kasvulla hyvinvointia, in Finnish (Report on the Future focusing on well-being and sustainable growth)

A continuous foresight of the Foresight network: Foresight.fi

A continuous foresight of the TeamFinland network: [The Future Watch service](http://TheFutureWatchservice)

Evaluations of the main actors, their roles and impacts in the national innovation policy

The Evaluation of the Finnish National Innovation System 2009

The evaluation of VTT 2010

The evaluation of Tekes 2012; The report describes the rationale for Tekes and the role of Tekes in Finnish systems and evaluates its impacts.

The evaluation of Finnvera 2012

The evaluation of the Academy of Finland 2013

The evaluation of the FII (TESI) 2013

The evaluation of the Strategic centres for science, technology and innovation 2013

The evaluation of the Research and Innovation Policy Council 2014

A Study on the Impacts of the Evaluations Made in 2009-2014 (2013, in Finnish)

Other evaluations

[The state of the scientific research in Finland 2014](#)

[The Vigo Programme Mid-Term Evaluation](#); MEE report 4/2013

[Regions in global ecosystems - Final evaluation of the Finnish Centre of expertise programme](#) (OSKE) 2013

[The impact of high-growth entrepreneurship policy in Finland 2015](#); Science|Business Innovation Board assessment of the YIC and Vigo programmes

[Kasvuväylä-palvelun väliarviointi](#); Kasvuväylä-palvelun väliarviointi; TEM raportteja 41/2013

[Aineettomien oikeuksien verokannustin, Kansainvälinen vertailu ja Suomen malli](#); TEM raportteja 32/2012

[Nordic Growth Entrepreneurship Review 2012](#), Norden, Nordic Innovation Publication 2013:01

Tekes evaluations 2012-15

Evaluations of Tekes programmes 2012-15

Similar paths, different approaches – Evaluation of the ICT sector programmes in Finland and Sweden 3/2015

<http://www.tekes.fi/globalassets/julkaisut/similarpathsdifferentapproaches.pdf>

Innovation in Natural Resources 2/2015

http://www.tekes.fi/globalassets/julkaisut/innovation_in_natural_resources_2_2015.pdf

Evaluation of well-being oriented SME innovation programmes aiming at international growth 7/2014 http://www.tekes.fi/globalassets/julkaisut/elvi_arviointi_7_2014.pdf

Boost to the sector – Evaluation of real estate and construction programmes 6/2014

http://www.tekes.fi/globalassets/julkaisut/boost_to_the_sector.pdf

Evaluation of the Finnish Distinguished Professor (FiDiPro) programme 5/2014

http://www.tekes.fi/globalassets/julkaisut/fidipro_evaluation_5_2014.pdf

Evaluation of the NeoBio and SymBio programmes 3/2014

http://www.tekes.fi/globalassets/julkaisut/neobio_symbio_3_2014.pdf

Path to creating business from research - Evaluation of TULI Programmes 2/2013

http://www.tekes.fi/globalassets/julkaisut/tuli_arviointiraportti.pdf

Software, mobile solutions and games industry - Evaluation of Tekes' software related programmes 2/2012 http://www.tekes.fi/globalassets/julkaisut/software_mobile_solutions.pdf

Co-operation to Create Converging and Future Networks – Evaluation of Five Telecommunications Programmes <http://www.tekes.fi/globalassets/julkaisut/telecommunications.pdf>

Kakkosnelosta ja liiketoimintaluovuutta – Puualan ohjelmien jälkiarviointi 2/2011 (in Finnish, with English abstract). Tekes initiated an ex post evaluation of the six technology programmes to provide some ideas on what should be done to activate the wood industry companies and to look at what can be learned from the past <http://www.tekes.fi/globalassets/julkaisut/puuala.pdf>

Monialaistuva ohjelmatoiminta – MASI- ja Digitaalinen tuoteprosessi -ohjelmien arviointi 8/2010 (in Finnish, with English abstract). This report presents the results of the ex-post evaluation of Tekes Programme on Modelling and Simulation 2005–2009 (MASI) and the mid-term evaluation of Tekes Programme on Digital Product Process 2008–2012 (DTP).

http://www.tekes.fi/globalassets/julkaisut/masi_ja_dtp_arviointi.pdf

From Spearheads to Hunting – Evaluation of Nano Programmes in Finland 6/2010

http://www.tekes.fi/globalassets/julkaisut/nano_arviointi.pdf

Kohti uutta tuotantoajattelua – SISU 2010- ja Tuotantokonseptit -ohjelmien arviointi 7/2010 (in Finnish, with English abstract). A final evaluation for the SISU 2010 – Innovative Manufacture technology programme and an intermediate evaluation of the Concepts of Operations (2007–2011) programme.

http://www.tekes.fi/globalassets/julkaisut/sisu_tuotantokonseptit_arviointiraportti.pdf

Arjen muutoksista työelämän innovaatiotoiminnaksi – Työelämän kehittämisohjelma (TYKES) 2004-2010 (in Finnish, with English abstract). TYKES programme aimed to further the development of the ways of operation of Finnish companies and other work organisations and to develop the innovation environments of workplaces. The evaluation covered both the realisation of the programme's aims and its long-term effects. In addition, an international comparison of the programme was involved.

<http://www.tekes.fi/globalassets/julkaisut/tyoelama.pdf>

[Valtakari, M. et al. \(2013\) Pharma-ohjelman loppuarviointi sekä Diagnostiikka- ja Lääke 2000-ohjelmien jälkiarviointit. Tekesin ohjelmaraportti 3/2013.](#)

Tekes Impact studies 2012-15

Impact of Tekes on Capabilities 318/2015

http://www.tekes.fi/globalassets/julkaisut/impact_of_tekes_on_capabilities.pdf

Impact of Tekes activities on productivity and renewal 315/2014

http://www.tekes.fi/globalassets/julkaisut/impact_of_tekes_activities_on_productivity_and_renewal.pdf

The Impact of Tekes Activities on Wellbeing and Environment 308/2014

http://www.tekes.fi/globalassets/julkaisut/wellbeing_and_environment_308_2014.pdf

Hyvinvoiva yhteiskunta ja ympäristö - Katsaus Tekesin vaikuttavuudesta 292/2012 (in Finnish). The study focuses on societal impact of Tekes activities.

http://www.tekes.fi/globalassets/julkaisut/292_12_hyvinvoiva_yhteiskunta_ja_ymparisto.pdf

Tuottavuus ja uusiutuminen - Katsaus Tekesin vaikuttavuudesta 293/2012 (in Finnish)

The study focuses on productivity and renewal impact of Tekes activities.

http://www.tekes.fi/globalassets/julkaisut/tuottavuus_ja_uusiutuminen_293_12.pdf

Capabilities for innovation activities Impact Study 291/2012

http://www.tekes.fi/globalassets/julkaisut/capabilities_for_innovation_activities.pdf

Funder, activator, networker, investor...Exploring Roles of Tekes in Fuelling Finnish Innovation 289/2012

http://www.tekes.fi/globalassets/julkaisut/funder_activator_networker_investor.pdf

"Naumanen, M. – J. Oksanen (2014), Sfinno – Suomalaiseen innovaatiokyselyyn perustuvia havaintoja Tekesin vaikuttavuudesta ja vaikuttavuuden kehittymisestä, VTT

Evaluations of Tekes activities

Reaching out for knowledge innovation and markets 1/2015

http://www.tekes.fi/globalassets/julkaisut/1_2015_reaching_out_for_knowledge_innovation.pdf

Energiatutkimusta IEA-yhteistyössä – Suomen osallistumisen arviointi 2010 (in Finnish, with English abstract). The evaluation is about Finland's participation in the energy research activities of the International Energy Agency (IEA).

<http://www.tekes.fi/globalassets/julkaisut/iea.pdf>

"Licence to SHOK?" External Evaluation of the Strategic Centres for Science, Technology and Innovation http://www.tekes.fi/globalassets/julkaisut/licence_to_shok.pdf

Vaikuttavuutta sovelluksista - Suomalaisen avaruustoiminnan arviointi 2012. The effects of Finnish space activities were examined through three perspectives. They are: 1) impacts on business operations, 2) impacts on research and competence, and 3) impacts on the activities of the public sector.

http://www.tekes.fi/globalassets/julkaisut/avaruustoiminnan_arviointi_294_12.pdf

Better results, more value - A framework for analysing the societal impact of Research and Innovation 288/2011

http://www.tekes.fi/globalassets/julkaisut/better_results_more_value.pdf

Ahokangas, P. et al. (2013) Innovation Mill-evaluointi.

An Assessment of the Impact of the Young Innovative Companies (NIY) Programme (2013), The Evidence Network. [http://pienyrittyskeskus.aalto.fi/en/midcom-serveattachmentguid-](http://pienyrittyskeskus.aalto.fi/en/midcom-serveattachmentguid-1e3873ebdeba5ce873e11e3a27aada6dac145574557/niy_impact_assessment_final_june_17_2013-002.pdf)

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Etlatiето Oy (2012), Tilastoanalyysi Tekesin asiakkaiden tuottavuudesta, Helsinki

A Comprehensive Analysis of the Impact of the Global Access Programme (GAP) on Finnish Companies Supported by Tekes 2004--2011, The Evidence Network 2012, Canada. https://www.tekes.fi/globalassets/julkaisut/impact_of_gap-programme.pdf

GAP-ohjelman loppuraportti (2012): An Assessment of the Impact of UCLA's Global Access Programme (GAP) on Finnish Companies supported by Tekes 2010--2011, The Evidence Network, Canada.

Hyvärinen, J. (2015) Evaluation of Tekes Activities - Main Methods and Impacts 320/2015, Tekes Review 320/2015

Riipinen, T. et al. (2014), Aineettoman pääoman siirtyminen Tekesin päättäneissä asiakasyrityksissä, väliraportti, Tempo Economics Oy.

Evaluations of the Academy of Finland 2012 – 2015

Evaluations of the Research Programmes of the Academy

Research Programme on Power and Society in Finland (VALTA) 2007-2010, evaluation report (2012)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/2_12_valta.pdf

Research Programme on Sustainable Production and Products (KETJU) 2006-2010, evaluation report (2012)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/4_12_ketju.pdf

Research Programme on Business Know-how (LIIKE2) 2006–2009, evaluation report (2012)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/5_12_liike2.pdf

Research Programme on the Future Work and Well-Being (WORK) 2008-2011, evaluation report (2013)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/2_13_work.pdf

Research Programme on Nutrition, Food and Health (ELVIRA, 2006-2010), evaluation report (2013)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/3_13-elvira.pdf

A summary of the Sustainable Energy Research Programme (SusEn), 2008– (2013)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/energia-ohjelma/summary-of-the-sustainable-energy-research-programme-susen_ss_16092013.pdf

Research Programme on Substance Use and Addictions 2007-2010, evaluation report (2014)

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/1_14_substance-use-and-addictions.pdf

Other evaluations of the Academy

Sport Sciences in Nordic Countries (2012), Publications of the Academy of Finland 1/12.

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/1_12_sport-sciences-in-nordic-countries.pdf

Ecology and evolutionary biology in Finland 2006-2010 (2012), Publications of the Academy of Finland 3/12.

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/3_12_ecology-and-evolutionary-biology.pdf

Physics Research in Finland 2007–2011 (2012), Publications of the Academy of Finland 8/12.

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/8_12_physics-research.pdf

Media and Communication Research in Finnish Universities 2013, Publications of the Academy of Finland 1/13.

http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/1_13_media-and-communication.pdf

Plant Science in Finland Follow up (2014)

<http://www.aka.fi/globalassets/awanhat/documents/tiedostot/julkaisut/plantevaluationreport2014web.pdf>

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